DOE/ID-10554
Revision 0
April 1999

U.S. Department of Energy
Idaho Operations Office

Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study

INEEL
IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

DOE/ID-10554
Revision 0

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4/26/99
Date

Prepared for the
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Assistant Secretary for Environmental Management
Idaho Operations Office
Contract-DE-AC07-94ID13223

ABSTRACT

This work plan specifies the management framework and requirements for conducting the comprehensive remedial investigation/feasibility study for Waste Area Groups 6 and 10 Operable Unit 10-04 at the Idaho National Engineering and Environmental Laboratory. Note that significant issues exist that will affect this work plan and ultimately the schedule and scope of the Operable Unit 10-04 comprehensive remedial investigation/feasibility study. These issues are first discussed in the summary that follows this abstract.

This work plan describes the physical characteristics and regulatory history of the Idaho National Engineering and Environmental Laboratory site, and uses previous sampling activities and available data to describe Waste Area Groups 6 and 10 site contaminants and sources, explain the rationale used in developing this work plan, specify the tasks of the Operable Unit 10-04 comprehensive remedial investigation/feasibility study, and define the project's schedule and management. This work plan also includes a preliminary conceptual site model, preliminary remedial action alternatives, and preliminary applicable or relevant and appropriate requirements, and data gaps and data quality objectives for proposed remedial investigation activities.

The appendices in this work plan detail proposed field activities; quality assurance activities; data management and document control requirements, policies, and procedures to protect workers and the environment during field investigations; and policies, procedures, and activities that the U.S. Department of Energy will use to involve the public in the decision-making process for the Operable Unit 10-04 comprehensive remedial investigation/feasibility study.

SUMMARY

This work plan was prepared for the U.S. Department of Energy Idaho Operations Office (DOE-ID) in accordance with the Federal Facility Agreement and Consent Order (FFA/CO) for the Idaho National Engineering and Environmental Laboratory (INEEL). This work plan will be used with documents from previous investigations (i.e., Track 1, Track 2, interim action, and remedial investigation) to guide the comprehensive remedial investigation/feasibility study (RI/FS) for Waste Area Groups (WAGs) 6 and 10 Operable Unit (OU) 10-04.

This work plan is intended to serve two purposes: (1) to meet the current FFA/CO enforceable milestone, identify and recommend approaches to resolve OU 10-04 data gaps, and provide the planning necessary to implement the current DOE FY-99 baseline; and (2) to propose and present an alternate OU 10-04 RI/FS schedule that would be performed in two phases—OU 10-04A (also known as OU 10-04) RI/FS and OU 10-04B (also known as OU 10-08) RI/FS. The alternative schedule would ensure that current project objectives are met.

The final OU 10-04 RI/FS Scope of Work (SOW) outlined an OU 10-04 RI/FS completion schedule that was approximately 18 months ahead of the FFA/CO schedule. To allow for the use of data still being collected by the other WAGs, data critical to the OU 10-04 comprehensive RI/FS assessment of INEEL-wide issues, the OU 10-04 RI/FS schedule was later delayed to align with the FFA/CO schedule. However, significant issues involving schedule and scope still exist that affect this work plan.

The current FFA/CO schedule does not accommodate the recent schedule extensions in other WAG-site investigations, namely OU 3-14 and OU 7-13/14. Consequently, some potentially decisive data needed to help ensure that the ground water and ecological assessments are complete and accurate will not be available for inclusion in the OU 10-04 comprehensive RI/FS. Decision-making based on incomplete assessments can have significant economic and health consequences.

The OU 10-04 comprehensive RI/FS will review previous investigations, assess uninvestigated sites, and evaluate the cumulative risk posed by the WAGs 6 and 10 sites. The WAGs 6 and 10 sites, as identified in the screening and data gap analysis reports (SDGA), will undergo cumulative and comprehensive assessment to evaluate overall risk. The objectives of the OU 10-04 comprehensive RI/FS are to:

- Assess the extent of contamination associated with sites identified in WAGs 6 and 10 (OU 10-04)

- Determine WAGs 6 and 10 site-specific transport properties through review of past investigations and on the basis of results of planned field activities (OU 10-04)

- Evaluate the current and future cumulative and comprehensive risk posed by the contaminants of concern at WAGs 6 and 10 sites to human health and the environment (OU 10-04)

- Conduct a qualitative cumulative ground water risk assessment for the Snake River Plain Aquifer within the INEEL boundary and beyond as necessary (OU 10-08)

- Evaluate the risk to INEEL ecological receptors (OU 10-04)

- Develop preliminary remediation goals and remedial action objectives based on risk, and evaluate the appropriate remedial action alternatives based on the nine Comprehensive Environmental Response, Compensation, and Liability Act criteria. (OU 10-04 and OU 10-08)

- Establish preliminary remedial action alternatives by combining appropriate remedial process options with general response options (containment, treatment, institutional controls, etc.). (OU 10-04 and OU 10-08)

An integral component of a remedial investigation is a baseline risk assessment (BRA). The BRA for WAGs 6 and 10 will include evaluations of assumptions and previous risk assessments, new risk assessments of the most recent data, if needed, and a comprehensive cumulative risk assessment. As appropriate, sites, contaminants, and pathways retained for the cumulative risk assessment of all WAGs 6 and 10 sites will include the following:

- Data validation and usability summary for OU 10-04 field characterization

- Cumulative fate and transport modeling (as required)

- Human health evaluation, which will include the following:

  - Description of data collection and evaluation

  - Exposure assessment

  - Toxicity assessment

  - Risk characterization

- Ecological characterization.

The OU 10-04 comprehensive RI/FS will develop and evaluate specific remedial alternatives using Comprehensive Environmental Response, Compensation, and Liability Act criteria. After completion of the RI/FS, a proposed plan will present the preferred remedial alternatives along with other options. The remedial alternatives selected will be presented in the Record of Decision (ROD) for WAGs 6 and 10 sites.

This work plan summarizes regional and local geology, meteorology, and hydrology; describes the INEEL location demography, land use, and regulatory history; and reviews the WAGs 6 and 10 contamination, potential applicable or relevant and appropriate requirements (ARARs), preliminary remedial alternatives, and preliminary conceptual site models.

This work plan contains data-use requirements and data-quality objectives that will allow the RI/FS to meet its objectives. The data gaps and data quality objectives were used to prepare sampling plans.

The following appendices to the work plan provide the backup documentation and procedures for implementing the RI/FS:

Appendix A—New Site Identification Forms

Appendix B—Human Health Screening and Data Gap Analysis Report

Appendix C—Ecological Screening and Data Gap Analysis

Appendix D—Operable Unit 10-04 Ecological Risk Assessment Approach and Methodology

Appendix E—Selected References Defining the Extent of Groundwater Contamination at the INEEL

Appendix F—Field Sampling Plan for Operable Unit 10-04 Explosive Compounds

Appendix G—Field Sampling Plan for Operable Unit 10-04 Organic-Moderated Reactor Experiment Soil and Ground Water

Appendix H—Health and Safety Plans

Appendix I—WAG 6 and WAG 10 Lithologic Information

Appendix J—1994 and 1995 Security Training Facility Ground Water Monitoring Information

Appendix K—INEEL and Surrounding Area Hydrology

Appendix L—Field Sampling Plan for the Decontamination and Dismantlement of the Security Training Facility (referenced)

Appendix M—Health and Safety Plan for the Sampling, Decontamination, and Dismantlement of the Security Training Facility (referenced)

Appendix N—Newspaper Articles and Personal Interview Concerning Big Southern Butte

Appendix O—Ordnance Treatability Study Documents

Some source areas are outside the scope of the OU 10-04 comprehensive RI/FS because other laws and regulations cover them. Some possible source areas, considered colocated with existing facilities, have not been investigated because they are inaccessible (i.e., beneath structures). Upon closure, the risk from these areas may be estimated as part of the OU 10-04 comprehensive RI/FS or post-ROD process to evaluate the need for remediation.

The comprehensive investigations at WAGs 1–7 have identified release sites that have calculated ecological hazard quotients in excess of 1. In some cases, the WAGs have developed plans for remediating these sites but in other cases, the sites will be passed to OU 10-04 for evaluation of population level ecological risks. If a Record of Decision states that a site will be passed to WAG 10 for further evaluation of ecological risks, and this evaluation indicates the site requires additional remediation, then WAG 10 may be responsible for planning and performing the remediation. The remediation will be coordinated with the affected WAG managers to ensure it is consistent with other remedial actions that have been performed at the WAG.

If a WAG remediates a site that poses an unacceptable ecological risk, regardless of whether the site also poses an unacceptable human health risk, WAG 10 will perform an ecological evaluation on the post-remeidation contamination levels. WAG 10 will inform the affected WAG managers about the results of this evaluation and will assist with planning additional remediation, if necessary.

OU 10-08 may also be responsible for characterizing and performing necessary remedial activities at sites that are discovered after this work plan becomes final, even if these new sites are discovered inside the boundaries of WAGs 1–7. The WAG that discovers the site, with the concurrence of the agency remedial project managers, will be responsible for deciding whether the site will be passed to WAG 10, completing the new site identification process, and providing appropriate notifications that the site is being added to OU 10-08.

The exception to this rule applies to sites that have the same nature of contamination as other sites that are already being addressed by a WAG. If a WAG ROD has already evaluated all of the remedial alternatives that are appropriate for the new site, the new site may be retained by the affected WAG. A fact sheet, explanation of significant differences, or ROD amendment, whichever is appropriate, would be prepared by the WAG to cover investigation and remediation of the new site. If the previously evaluated alternatives are not appropriate for the new site, the agency remedial project managers will decide whether the site will be retained for a new evaluation of alternatives or passed to OU 10-08.

CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
AEF	Argonne Experimental Facility
AFSR	Argonne Fast Source Reactor
ANL	Argonne National Laboratory
ANL-W	Argonne National Laboratory-West
ANP	Aircraft Nuclear Propulsion
ARA	Auxiliary Reactor Area
ARAR	applicable or relevant and appropriate requirement
ARDC	Administrative Record and Document Control
ARVFS	Army Reentry Vehicle Facility Site
BAF	bioaccumulation factors
BLM	Bureau of Land Management
BORAX	Boiling Water Reactor Experiment
BRA	baseline risk assessment
C2	Category 2
CCOLM	CERCLA Compliance with Other Laws Manual
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CLP	contract laboratory program
COC	contaminant of concern
COCA	Consent Order and Compliance Agreement
COPC	contaminant of potential concern
CRAVE	Carcinogen Risk Assessment Verification Endeavor

CRP	Community Relations Plan
D&D	decontamination and dismantelment
DDP	decision documentation package
DF	dairy farm
DOD	Department of Defense
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DQO	data quality objective
EBR	Experimental Breeder Reactor
EBSL	ecologically based screening levels
EIS	environmental impact statement
EOCR	Experimental Organic-Cooled Reactor
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERA	ecological risk assessment
ERIS	Environmental Restoration Information System
ESRF	Environmental Science and Research Foundation
ESRP	Eastern Snake River Plain
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
FS	feasibility study
FSP	field sampling plan
FY	fiscal year
GIS	geographical information system
GPS	global positioning system

GRD3	Grid 3
HEAST	Health Effects Assessment Summary Tables
HH	human health
HI	hazard index
HASP	health and safety plan
HTRE	Heat Transfer Reactor Experiment
HQ	hazard quotient
HWD	hazardous waste determination
ICPP	Idaho Chemical Processing Plant
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IDW	investigation derived waste
IETF	Initial Engineering Test Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INEL	Idaho National Engineering Laboratory
INPS	Idaho Native Plant Society
INTEC	Idaho Nuclear Technology and Engineering Center
IRC	Independent Review Committee
IRIS	Integrated Risk Information System
LCCDA	Liquid Corrosive Chemical Disposal Area
LDRD	laboratory directed research and development
LMITCO	Lockheed Martin Idaho Technologies Company
LOFT	Loss-of-Fluid Test
MCL	maximum contaminant level
MCP	management control procedure

NaK	sodium potassium
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NERP	National Environmental Research Park
NOAA	National Oceanic and Atmospheric Administration
NODA	Naval Ordnance Disposal Area
NOTF	Naval Ordnance Test Facility
NPL	National Priority List
NERP	National Environmental Research Park
NRF	National Reactors Facility
NRTS	National Reactor Testing Station
NSIF	New Site Identification Form
NTCRA	nontime-critical removal action
OMRE	Organic-Moderated Reactor Experiment
OU	operable unit
PAH	polycyclic aromatic hydrocarbons
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCSM	preliminary conceptual site model
PRG	preliminary remediation goals
QAPjP	quality assurance project plan
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RDX	research development explosive, cyclotetrimethylene trinitroamine

RfD	reference dose
RI	remedial investigation
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RTF	Reactor Training Facility
RWMC	Radioactive Waste Management Complex
SARA	Superfund Amendments and Reauthorization Act
SDA	Subsurface Disposal Area
SDGA	screening and data gap analysis
SF	slope factor
SLERA	screening level ecological risk assessment
SOP	Standard Operating Procedure
SOW	scope of work
SRP	Snake River Plain
SRPA	Snake River Plain Aquifer
STF	Security Training Facility
SVOC	semivolatile organic compound
T/E	threatened or endangered
TAL	Target Analyte List
TAN	Test Area North
TAP	toxic air pollutants
TBC	to be considered
TBD	to be determined
TCA	trichloroethane

TCE	trichloroethene
TCLP	toxicity characterization leaching procedure
TNT	trinitrotoluene
TPH	total petroleum hydrocarbon
TRA	Test Reactor Area
T-RACT	toxic air pollutant reasonably available control technology
TRV	toxicity reference value
TSF	Technical Services Facility
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
USGS	United States Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
WAG	waste area group
WLAP	Wastewater Land Application Permit
WMO	Waste Management Office
WRRTF	Water Reactor Research Test Facility
ZPR-III	Zero Power Reactor No. 3

Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04 Comprehensive Remedial Investigation/Feasibility Study (Draft Final)

1. INTRODUCTION

The Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) requires evaluation of the Idaho National Engineering and Environmental Laboratory (INEEL) under the "Comprehensive Environmental Response, Compensation, and Liability Act" (CERCLA) (42 United States Code [USC] § 9601 et seq.). One FFA/CO requirement is the completion of the Operable Unit (OU) 10-04 comprehensive remedial investigation/feasibility study (RI/FS) for Waste Area Groups (WAGs) 6 and 10, hereafter referred to as the OU 10-04 RI/FS. This work plan provides the management framework and outlines tasks for the OU 10-04 RI/FS. The WAG 6 comprehensive RI/FS (OU 6-05) will be incorporated into the OU 10-04 RI/FS in accordance with the FFA/CO (DOE-ID 1991).

The final OU 10-04 RI/FS Scope of Work (SOW) outlined an OU 10-04 RI/FS completion schedule that was approximately 18 months ahead of the FFA/CO schedule. To allow for the use of data still being collected by the other WAGs, data critical to the OU 10-04 comprehensive RI/FS assessment of INEEL-wide issues, the OU 10-04 RI/FS schedule was later delayed to align with the FFA/CO schedule. However, significant issues involving schedule and scope still exist that affect this work plan.

The FFA/CO schedule does not accommodate the recent schedule extensions in other WAG-site investigations, namely OU 3-14 and OU 7-13/14. Consequently, some potentially decisive data needed to help ensure that the ground water and ecological assessments are complete and accurate will not be available for inclusion in the OU 10-04 comprehensive RI/FS. Decision-making based on incomplete assessments can have significant economic and health consequences.

This work plan is intended to serve two purposes: (1) to meet the current FFA/CO enforceable milestone, identify and recommend approaches to resolve OU 10-04 data gaps, and provide the planning necessary to implement the current DOE FY-99 baseline; and (2) to propose and present an alternate OU 10-04 RI/FS schedule that would be performed in two phases—the OU 10-04A (also known as OU 10-04) RI/FS and the OU 10-04B (also known as OU 10-08) RI/FS. Detailed schedules for these two phases are presented in Section 6.

The OU 10-04 RI/FS is a comprehensive process during which previous investigations will be combined, unassessed sites will be investigated, each interim and removal action will be reviewed, and the cumulative risk posed by each site will be evaluated in the RI report. The objectives of the OU 10-04 RI/FS are to:

- Assess the extent of contamination associated with sites identified in WAGs 6 and 10
- Determine site-specific contaminant transport through review of past investigations and the results of planned field activities
- Evaluate the current and future cumulative and comprehensive risk to human health and the environment posed by contaminants of concern (COCs) at WAGs 6 and 10

- Conduct a qualitative cumulative ground water risk assessment for the SRPA within the INEEL boundary and beyond, as necessary
- Evaluate the risk to INEEL ecological receptors
- Establish preliminary remedial action alternatives by combining appropriate remedial process options with general response options (e.g., containment, treatment, and institutional controls)
- Develop preliminary remediation goals (PRGs) and remedial action objectives (RAOs) based on risk, and evaluate the appropriate remedial action alternatives based on the nine CERCLA criteria (42 USC § 9601 et seq.).

The comprehensive investigations at WAGS 1–7 have identified release sites that have calculated ecological hazard quotients in excess of 1. In some cases, the WAGs have developed plans for remediating these sites but in other cases, the sites will be passed to OU 10-04 for evaluation of population level ecological risks. If a Record of Decision states that a site will be passed to WAG 10 for further evaluation of ecological risks, and this evaluation indicates the site requires additional remediation, then WAG 10 may be responsible for planning and performing the remediation. The remediation will be coordinated with the affected WAG managers to ensure it is consistent with other remedial actions that have been performed at the WAG.

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OU 10-08 may also be responsible for characterizing and performing necessary remedial activities at sites that are discovered after this work plan becomes final, even if these new sites are discovered inside the boundaries of WAGS 1–7. The WAG that discovers the site, with the concurrence of the agency remedial project managers, will be responsible for deciding whether the site will be passed to WAG 10, completing the new site identification process, and providing appropriate notifications that the site is being added to OU 10-08.

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1.1 Site Background and Regulatory History

The INEEL is a government-owned reservation managed by the U.S. Department of Energy (DOE). The eastern boundary of the INEEL is located 51 km (32 mi) west of Idaho Falls, Idaho (Figure 1-1). The INEEL Site occupies approximately 2,305 km^2 (890 mi^2) of the northern portion of the Eastern Snake River Plain (ESRP). The INEEL Site is nearly 63 km (39 mi) long from north to south and about 58 km (36 mi) in its broadest southern portion. The INEEL includes portions of Bingham, Bonneville, Butte, Clark, and Jefferson counties (DOE-ID 1997). Figure 1-2 is a map of the INEEL and

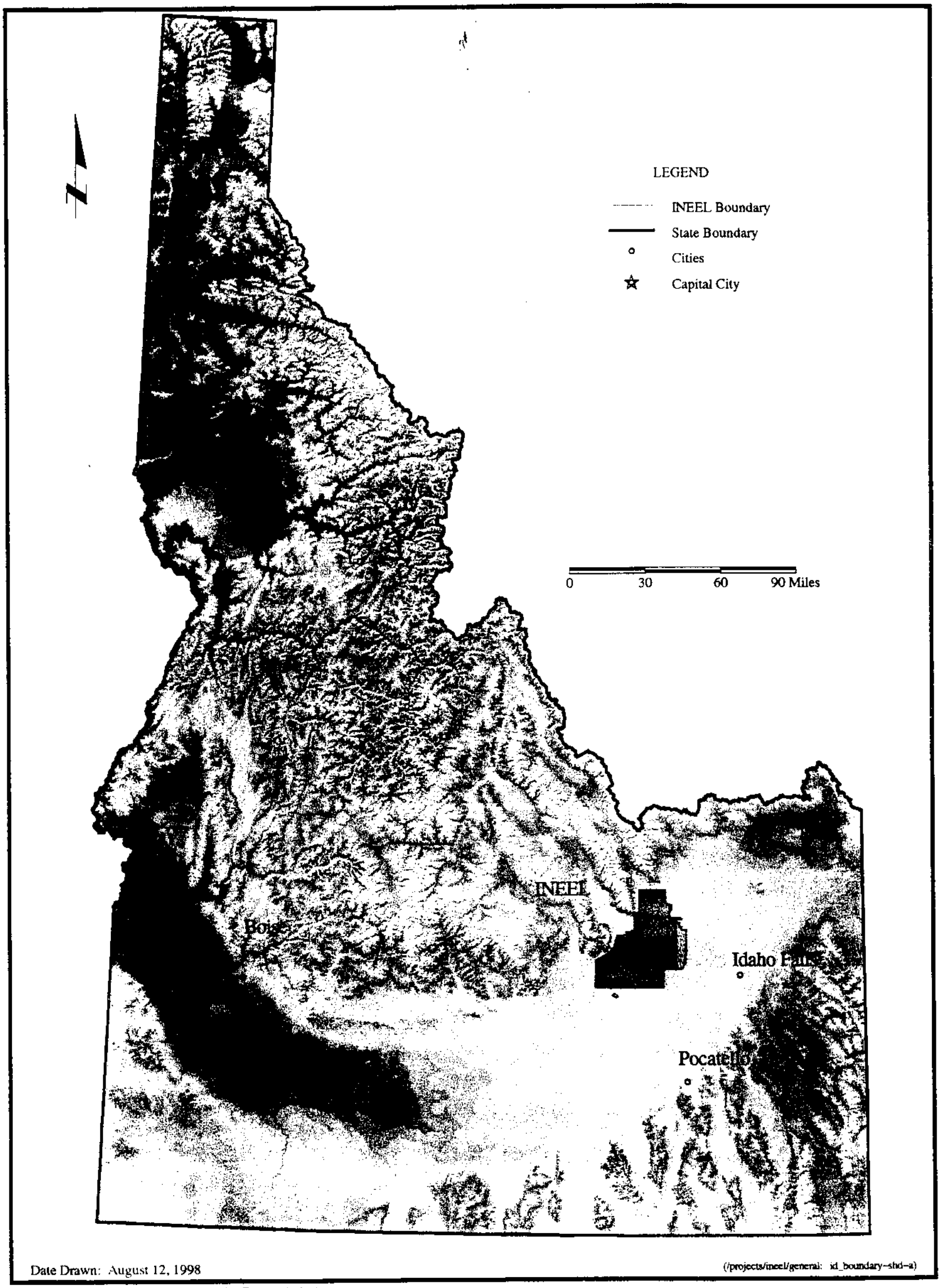
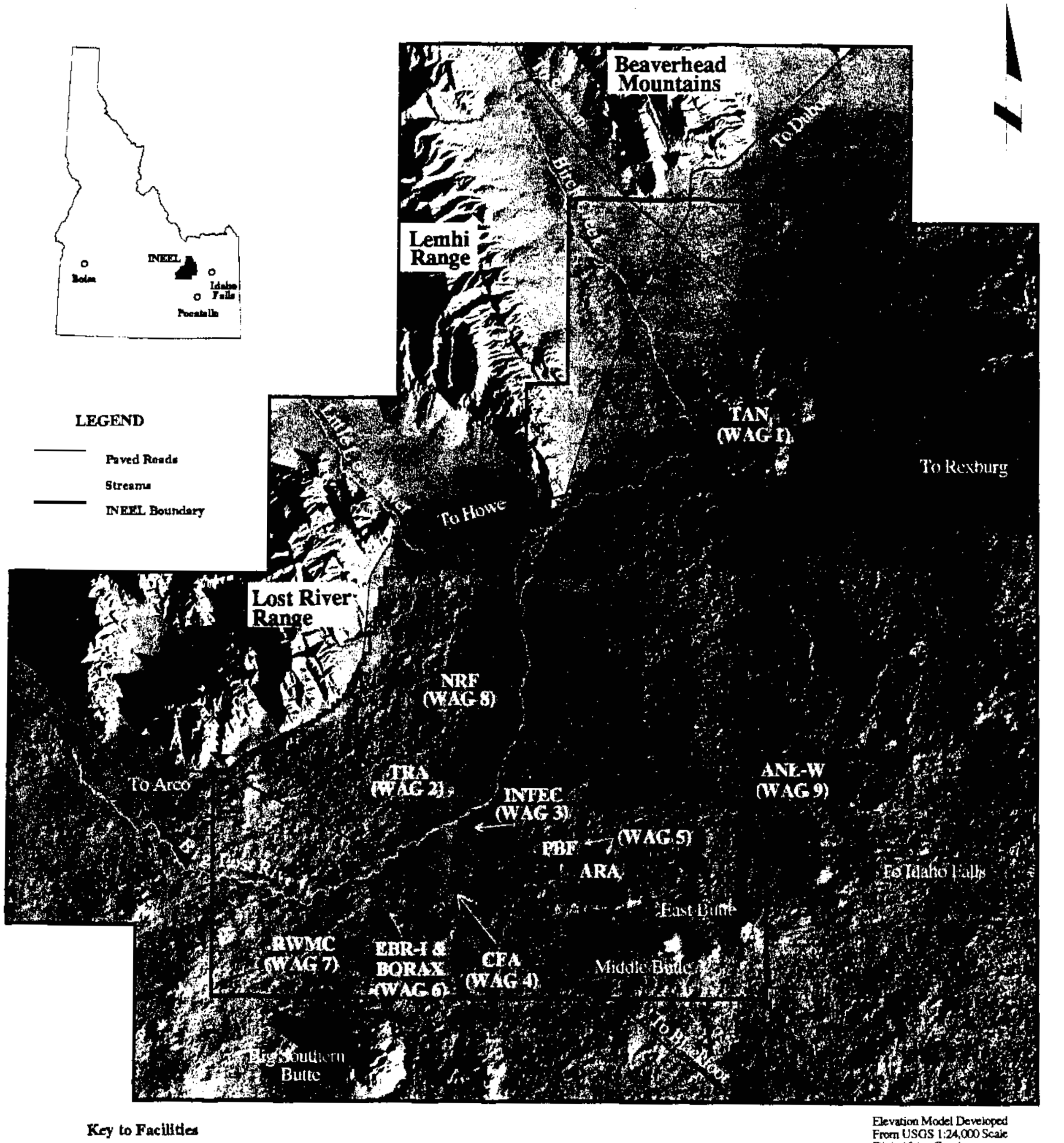


Figure 1-1. The INEEL Site vicinity map.

Idaho National Engineering and Environmental Laboratory



Key to Facilities

ANL-W	–	Argonne National Laboratory–West
ARA	–	Auxiliary Reactor Area
BORAX	–	Boiling Water Reactor Experiment
CFA	–	Central Facilities Area
EBR-I	–	Experimental Breeder Reactor–I
INTEC	–	Idaho Nuclear Technology & Engineering Center
NRF	–	Naval Reactor Facility
PBF	–	Power Burst Facility
RWMC	–	Radioactive Waste Management Complex
TAN	–	Test Area North
TRA	–	Test Reactor Area

0 5 10 15 Miles

0 10 20 30 Kilometers

Elevation Model Developed
From USGS 1:24,000 Scale
Digital Line Graphs

COORDINATE SYSTEM: Stateplane
PROJECTION: Transverse
DATUM: NAD27
ZONE: 3701
UNITS: Feet

Date Drawn: August 12, 1998

(/gis/d08/tindemo: shade–wags)

Figure 1-2. Location of INEEL facilities and general area of WAGs 6 and 10 site.

identifies some of its major facilities and the general area of the WAGs 6 and 10 sites. The WAG 10 is not labeled on Figure 1-2 because it covers a large area (see Figure 2-4 for the location of Big Southern Butte), as described in Subsection 1.1.2.

1.1.1 History of the INEEL

During World War II, the U.S. Navy and Army used a large portion of the area that is now the INEEL as a gunnery and bombing range. In 1949, the U.S. Atomic Energy Commission (AEC) established the National Reactor Testing Station (NRTS) on the Site. The NRTS was renamed twice: first as the Idaho National Engineering Laboratory (INEL) in 1974, and then as the INEEL in 1997 (DOE-ID 1997).The U.S. Bureau of Land Management (BLM) controlled the land, primarily as range land, before the NRTS was established. Public land orders in 1946, 1949, and 1950, withdrew the land from the public domain. Since 1957, approximately 699 km^2 (270 mi^2) of the INEEL, excluded from public access, has been relatively undisturbed. Currently, between 1,217 and 1,425 km^2 (470 and 550 mi^2) are open to grazing through BLM administered permits. The DOE established the INEEL as a National Environmental Research Park (NERP), which is one of only two such parks in the United States that allow comparative ecological studies in sagebrush-steppe ecosystems (DOE-ID 1997).

1.1.2 Regulatory History

On July 14, 1989, the EPA proposed placing the INEEL on the National Priorities List (NPL) of the *National Oil and Hazardous Substances Contingency Plan* (NCP) (40 Code of Federal Regulations [CFR] 300). The EPA Region 10 (with public participation during a 60-day comment period following the proposed listing) issued a final rule on November 21, 1989, that listed the INEEL on the NPL (54 Federal Register [FR] 48184). As a federal facility, the INEEL is eligible for the NPL pursuant to NCP requirements in 40 CFR 300.66(c)(2).

The FFA/CO (DOE-ID 1991) establishes the procedural framework and schedule for response actions at the INEEL in accordance with the CERCLA, the Resource Conservation and Recovery Act of 1980 (RCRA) (42 USC 690 et seq.), and the *Idaho Hazardous Waste Management Act* (Idaho Code 39-4401 et seq.). The FFA/CO, signed by DOE-ID, EPA Region 10, and the State of Idaho, identifies 10 WAGs at the INEEL (refer to Figure 1-2). The *Action Plan* of the FFA/CO categorizes the WAGs 6 and 10 sites into five OUs each. Since the signing of the FFA/CO, additional sites and OUs have been added to WAGs 6 and 10 (See Appendix A). Sites can be added through use of new site identification forms, which are maintained in the public administrative record.

The FFA/CO defines WAG 10 as the INEEL boundary or beyond, as necessary, to encompass any real or potential impact from INEEL activities and any areas within the INEEL not covered by other WAGs (DOE-ID 1991). Waste Area Group 10 encompasses a large area and much of that area is assumed to be uncontaminated. The assumed uncontaminated areas will be addressed in the OU 10-04 remedial investigation (RI) and data will be presented in the RI to support their exclusion (completed outside the RI) from the CERCLA site. The sites listed in Table 1-1 (see Subsection 1.3.4) are the only known release sites. There are no plans to expand the scope of the OU 10-04 RI/FS beyond these sites unless new sites are identified in the course of other activities or during implementation of characterization activities. However, the definition of WAG 10 has been updated for scoping the OU 10-04 RI/FS and future NPL deletion. Beyond the INEEL boundary, WAG 10 now includes a Big Southern Butte ordnance area, which originated from projectiles fired in 1968 from the onsite Naval Ordnance Test Facility (NOTF). No other potential off-Site ordnance areas are currently included in WAG 10. Along with Big Southern Butte, the WAG 10 area is also defined as the INEEL boundary minus WAGs 1 through 5, 7 through 9, and the Jefferson County landfill (58 FR 249). The RPMs determined that the

Jefferson County Landfill site was a no further action site at the time the land was turned over to the BLM to sell to Jefferson County for a multi-county landfill.

Most of the summary assessments and Track 1 and Track 2 investigations called for in the FFA/CO are complete and in the public administrative record. The following cases are exceptions:

- Instead of a Track 2 investigation, the OU 10-02 Organic-Moderated Reactor Experiment (OMRE) leach pond will be investigated during the OU 10-04 RI/FS.

- The OU 10-03 ordnance removal action reports will be incorporated into the OU 10-04 RI/FS by reference only. The separate documents will be placed in the public administrative record.

- The OU 10-06 RI/FS, which addressed radionuclide-contaminated soil at all the INEEL WAGs, was halted for performance of the OU 10-06 nontime-critical removal action (NTCRA). As a cost saving strategy, the OU 10-06 RI/FS and NTCRA report will be incorporated into the OU 10-04 RI/FS or appropriate WAG-specific RI/FS.

1.2 Work Plan Organization

This work plan is designed as a handbook for implementing OU 10-04 RI/FS activities and describes the sites, sampling data, contaminants, sources, data gaps, project management, tasks, and schedules. It also includes the preliminary conceptual site model (PCSM), human health and ecological risk assessment methodologies, RAOs, and applicable or relevant and appropriate requirements (ARARs). The following bullets briefly describe the sections and appendices of this work plan:

- Section 1 describes the background and history of WAGs 6 and 10, describes the work plan organization, gives an overview of WAGs 6 and 10 areas of concern, and introduces newly identified sites.

- Section 2 describes the site background and physical setting for the INEEL and WAGs 6 and 10. Specific discussions address physiography, meteorology, geology, hydrology, ecology, demography and land use, history of disposal operations, contamination background, previous investigations and remedial activities, and definitions of the areas included.

- Section 3 is the initial evaluation of WAGs 6 and 10, which includes a PCSM that evaluates potential risks to human health and the environment and identifies and sets priorities for site data collection activities. Descriptions of existing site conditions, potential migration and exposure pathways, and a preliminary assessment of exposure routes are provided. Also, the preliminary remedial action alternatives and ARARs are identified.

- Section 4 describes the rationale for this work plan. Data quality objectives (DQOs) and data needs and types are discussed, specific data gaps are identified, and the methodology to fill data gaps is given.

- Section 5 outlines the OU 10-04 RI/FS study tasks. In this section the specific tasks that will be conducted are identified: community relations, field investigations, sample analysis and data validation, data evaluation, and contaminant fate and transport modeling. A discussion of the baseline risk assessment (BRA), RI report, alternative screening and analysis, long-term monitoring implications, the proposed plan, enforcement aspects, and administrative support also are included.

- Section 6 contains the schedule for completion of the OU 10-04 RI/FS.

- Section 7 describes the project management plan which defines project organizational relationships and responsibilities, documentation requirements, and financial and project tracking requirements.

- Appendix A, "New Site Identification Forms" identifies the approved and disapproved new sites for WAGs 6 and 10.

- Appendix B, "Human Health Screening and Data Gap Analysis Report" outlines the screening methodology for sites and contaminants, discusses the results of the screening, identifies the data gaps associated with the sites and contaminants within WAGs 6 and 10, and lists the sites that will be evaluated further in the OU 10-04 RI.

- Appendix C, "Ecological Screening and Data Gap Analysis Report" is presented in two parts: Appendix C1, "Ecological Screening of WAGs 6 and 10 Sites," presents the results of the initial WAGs 6 and 10 ecological risk assessment (ERA) site screening; and Appendix C2, "Ecological Risk Assessment Data Gap Analysis Report," documents the status of the previously identified data gaps, identifies remaining and new data gaps that need to be addressed prior to the initiation of the OU 10-04 ERA, documents the status of the WAG-specific ERA activities, and presents a review of agency and stakeholder comments and concerns.

- Appendix D, "Operable Unit 10-04 Ecological Risk Assessment Approach and Methodology" is presented in four parts: Appendix D1, "Operable Unit 10-04 Ecological Risk Assessment Approach and Methodology" discusses the phased approach used to perform ERAs at the INEEL and the methodology that will be used for the OU 10-04 ERA; Appendix D2, "Ecological Based Screening Levels (EBSLs) Calculations and Parameter Input Values" documents the calculations and parameter input values used to calculate EBSL and the EBSLs for both radionuclide and nonradionuclide contaminants; Appendix D3, "Waste Area Group Ecological Risk Assessment Exposure Models and Parameter Input Values" documents the models and input values used to model exposure for the WAG ERAs; and Appendix D4, "Toxicity Reference Value Development" documents the approach used to develop toxicity reference values (TRVs) for contaminants identified at the INEEL. This appendix also documents the TRVs used for both the EBSL and WAG ERA calculations.

- Appendix E, "Selected References Defining the Extent of Ground Water Contamination at the INEEL" lists the references that define the extent of ground water contamination.

- Appendix F, “Field Sampling Plan for Operable Unit 10-04 Explosive Compounds” describes the methods to be used for conducting the individual sampling activities at the ordnance sites during the OU 10-04 RI/FS.

- Appendix G, “Field Sampling Plan for Operable Unit 10-04 Organic-Moderated Reactor Experiment Soils and Ground Water” describes the methods to be used for conducting individual sampling activities during the OU 10-04 RI/FS.

- Appendix H, “Health and Safety Plan” describes the policies and procedures that will be implemented to protect site workers and visitors from potential hazards associated with RI activities.

- Appendix I, “WAG 6 and WAG 10 Lithologic Information” provides drilling and geophysical logs for selected wells.

- Appendix J, “1994 and 1995 Security Training Facility Ground Water Monitoring Information” provides water chemistry and sampling data from selected Security Training Facility (STF) wells.

- Appendix K, “INEEL and Surrounding Area Hydrology” includes detailed information of Site hydrology and ground water chemistry, and presents contaminant plumes for various radionuclides and chemicals along with background ground water and surface water chemistry information.

- Appendix L references the, “Field Sampling Plan for the Decontamination and Dismantlement of the Security Training Facility” which describes the method for conducting individual sampling activities during the decontamination and dismantlement (D&D) of the STF.

- Appendix M references the, “Health and Safety Plan for the Sampling, Decontamination, and Dismantlement of the Security Training Facility” which describes the health and safety policies and procedures for D&D sampling activities at the STF.

- Appendix N, “Newspaper Articles and Personal Interview Concerning Big Southern Butte” which substantiates that no live rounds were ever fired from the Naval Ordnance Test Facility at the butte.

1.3 Overview of Waste Area Groups 6 and 10

This subsection presents an overview of the WAGs 6 and 10 areas of concern. Subsections 1.3.1, 1.3.2, and 1.3.3 review WAG 6, WAG 10, and other INEEL sites, respectively. Subsection 1.3.4 includes Table 1-1, a focal point for the work plan, which summarizes the assumptions and the results of processes completed in subsequent work plan sections for each area of concern. For example, Table 1-1 includes an “Eliminate or Retain” list that gives the results of the Section 3 process, which determines if a site warrants evaluation in the OU 10-04 RI/FS. While the major work plan sections contain more information than Table 1-1 for specific sites, Table 1-1 shows many single location parameters, such as contaminants of potential concern (COPCs), remaining data gaps, and potential remedial alternatives, etc.

1.3.1 Waste Area Group 6

Waste Area Group 6 consists of OUs and sites related to Experimental Breeder Reactor (EBR)-I and the nearby Boiling Water Reactor Experiments (BORAX) area. The WAG 6 boundary encompasses both facilities, immediately adjacent areas, and subsurface areas. The EBR-I and BORAX areas are briefly described below. Additional information is included in Subsection 2.8.1.

1.3.1.1 EBR-I Complex. The EBR-I complex, now a registered National Historical Landmark, is in the southwest portion of the INEEL approximately 3.2 km (2 mi) from U.S. Highway 20. The EBR-I project conducted reactor experiments between 1951 and 1963. The first electricity ever generated from nuclear power occurred at EBR-I on December 20, 1951. In 1953, EBR-I scientists proved that a reactor could create more fuel than it used—that is, the reactor could "breed" fuel as it created electricity. Project buildings included the EBR-I reactor building (EBR-601); two additions to EBR-601, a fuel storage facility, and personnel offices; the Zero Power Reactor No. 3 (ZPR-III) Reactor Training Facility (RTF) Building RTF-601 (later designated Waste Management Operations [WMO]-6010); the Argonne Fast Source Reactor (AFSR) shielding building (EBR-605); the sodium potassium (NaK) storage pit; and the NaK disposal pad. Two nuclear jet engines, Heat Transfer Reactor Assemblies (HTRE)-2 and HTRE-3 from the Aircraft Nuclear Propulsion (ANP) program, are displayed outside the EBR-I perimeter fence as part of the National Historical Landmark.

1.3.1.2 BORAX Facility. The BORAX facility, located approximately 1.21 km (0.75 mi) north of the EBR-I facility, was the site of five (BORAX I, II, III, IV, and V) reactor experiments conducted between 1953 and 1964. The BORAX I reactor was intentionally destroyed in 1954 to determine its inherent safety under extreme conditions and afterward was buried in place. In a nearby location, BORAX II, III, and IV shared the same reactor vessel, but used different fuel designs and core configurations. On July 17, 1955, BORAX III gained historical significance as the first nuclear reactor in the world to supply electricity to a community (Arco, Idaho). The BORAX II, III, and IV reactor fuels and vessel components were dispositioned by Argonne National Laboratory (ANL) personnel at the completion of each respective experiment. The BORAX V experiments used a new reactor vessel and core system. The inactive BORAX II, III, and IV reactor vessel was used to store fuel elements. Upon completion of the BORAX V experiments, all the reactor fuel and portions of the internal reactor were removed (Rodman 1995).

1.3.2 Waste Area Group 10

Waste Area Group 10 includes miscellaneous INEEL sites and the SRPA outside the other WAGs. Waste Area Group 10 also includes a Liquid Corrosive Chemical Disposal Area (LCCDA), OMRE leach pond, STF sumps, pits, and gun range, and numerous ordnance areas. Table 1-1 lists the miscellaneous sites, LCCDA, OMRE, and ordnance areas. The SRPA is briefly described in the following paragraph, listed in Table 1-1, and covered in detail in Section 2 and Appendix K.

The SRPA underlies nearly all the ESRP. Water storage in the aquifer is estimated at 2.5×10^{12} m^3 (2×10^9 acre-ft), or about the same volume as Lake Erie. Portions of the aquifer have been affected by INEEL activities. The WAG 10 ground water area, per the FFA/CO includes the SRPA within the INEEL boundary and beyond, if needed, minus the ground water plume boundaries of WAGs 1 through 5 and 7 through 9. The specific ground water plumes within each WAG are assessed by the individual WAG, and all INEEL ground water issues will be qualitatively assessed in the OU 10-04 RI/FS. The cumulative ground water assessment strategy is documented in the *OU 10-04 Groundwater Strategy Technical Memorandum* (LMITCO 1996).

1.3.3 Other INEEL Sites Included in the OU 10-04 RI/FS

Sites being evaluated in the OU 10-04 RI/FS include FFA/CO listed sites, facility assessment sites, newly identified sites, and unevaluated sites. The FFA/CO listed sites have been identified above. This subsection discusses facility assessment sites, newly identified sites, and unevaluated sites.

1.3.3.1 Facility Assessment Sites. Facility assessment sites are not assessed as FFA/CO listed sites, but are assessed for contribution to the cumulative risk of nearby WAGs 6 or 10 sites. The OU 10-04 RI/FS facility assessment sites include the EBR-I area and the STF.

EBR-I—The EBR-I reactor building and the HTRE assemblies, now tourist attractions, will be scheduled for D&D once no longer needed. The structures are within the cumulative impact range of several EBR-I sites listed in Table 1-1. It is possible that previously undiscovered past releases may be discovered during D&D activities. Therefore, EBR-I structures will be retained for evaluation in the OU 10-04 RI/FS.

Security Training Facility—The STF is located approximately 4 km (2.5 mi) east of the Central Facilities Area (CFA) occupying facilities originally built for the Experimental Organic-Cooled Reactor (EOCR). The EOCR project was canceled at about 90% completion in September 1962. After most system components were removed, the EOCR facility became a center for security personnel training. Several EOCR systems (see Table 1-1) are FFA/CO listed WAG 10 sites (all no action). Some STF sites could impact the cumulative risk of these WAG 10 sites. For example, the STF building contains asbestos, and the nearby gun range berm contains lead and other metals. The STF facility is scheduled to undergo D&D in 1998. The basement of the STF building (STF-601) has several sumps and pits that contain a significant amount of water. The water level has fluctuated as evidenced by the stains on the walls. Sampling of the sumps and pits will be conducted during fiscal year (FY)-98 by D&D but is included as part of this work plan. The gun range berm and surrounding soils also were added as a new site (STF-02) OU 10-04, and will be included as part of this work plan to be sampled in FY-99. The field sampling plan (FSP) for these sampling activities is included as Appendix L. The OU 10-04 RI/FS will use the STF D&D sampling data to assess STFs contribution to cumulative risk.

1.3.3.2 Newly Identified and Unevaluated Sites. As defined in Appendix A, newly identified sites were unidentified in previous OU documents and require evaluation in the OU 10-04 RI/FS. An "unevaluated site" (also defined in Appendix A), like a newly identified site, requires evaluation in the OU 10-04 RI/FS. Each newly identified site and unevaluated site is further discussed in Subsection 2.8. By February 23, 1998, 37 new site identification forms (NSIFs) had been completed, of which 30 did not meet the requirements for inclusion in the FFA/CO—these 30 sites are listed in Appendix A. Of the remaining 7 NSIFs submitted, 4 resulted in FFA/CO listings and 3 are pending as follows:

- BORAX-08: BORAX ditch
- BORAX-09: BORAX II–V reactor facility (AEF-601/ANL-717)
- OU 10-06: radionuclide-contaminated soil areas
- OU 10-07: U.S. West buried telecommunications cable

- STF-01: STF-601 sumps and pits; includes outside cooling tower sump (NSIF pending)
- STF-02: STF gun range (NSIF pending)
- ORD-29: Big Southern Butte, north face (NSIF pending).

Because of revisions to the NSIF process, all 37 NSIFs are being resubmitted to DOE-ID for transmittal to EPA and IDHW-DEQ. It is assumed previous decisions will be upheld.

1.3.4 Summary of WAGs 6 and 10 Investigations (Table 1-1)

Because of the large number of WAGs 6 and 10 areas of concern, Table 1-1 is split into separate fold-outs grouped as follows: WAG 6, WAG 10, ordnance, aquifer, and ecological. For each area of concern, Table 1-1 includes:

- OUs, site codes, and site descriptions
- FFA/CO proposed actions, existing FFA/CO documents, status, and subsequent recommendations (Compiled from Section 2 information)
- COPCs and the potentially contaminated media (Compiled from Section 2 information)
- Whether the site is retained for evaluation in the OU 10-04 RI/FS, the justification, and whether the evaluation will be as part of the BRA and/or ERA (Compiled from Section 3 information)
- Separate RI and FS data gaps for the BRA and ERA (Compiled from Section 4 information)
- Separate RI and FS tasks to resolve data gaps for the BRA and ERA (Compiled from Section 4 information)
- Whether the site requires additional data (Compiled from Section 4 information)
- Preferred alternatives to be considered in the FS as discussed during agency scoping meetings (Compiled from Section 4 information).

Note that no FS will be performed for ordnance sites. A presumptive remedy of "Mag and Flag" removal performed for safety reasons or type of institutional control will be evaluated.

1.4 References

40 CFR 300, Title 40, "Protection of Environment," Chapter 1, "Environmental Protection Agency," Part 300, National Oil and Hazardous Substance Pollution Plan, *Code of Federal Regulations*, Current issue.

54 FR 48184, 40 CFR 300, "Environmental Protection Agency National Priorities List of Uncontrolled Hazardous Waste Sites," *Code of Federal Regulations*, Final Rule.

58 FR 249, 40 CFR 300, "Environmental Protection Agency National Priorities List of Uncontrolled Hazardous Waste Sites," *Code of Federal Regulations,* Final Rule.

42 USC § 9601 et seq., December 11, 1980, "Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/Superfund) of 1980," *United States Code.*

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, 1088-06-29-120, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency, Region 10; State of Idaho, Department of Health and Welfare.

DOE-ID, 1997, *Scope of Work for Operable Unit 10-04 WAGs 6 and 10 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10553, March 1997.

Idaho Code 39-4401, "Hazardous Waste Management Act of 1983," Title 39, "Health and Safety," Chapter 44, "Hazardous Waste Management."

LMITCO, 1996, OU 10-04 *Groundwater Strategy Technical Memorandum,* INEL-96/0083, Revision 0, Lockheed Martin Idaho Technologies Company.

Rodman, G. R., 1995, *Post-Decommissioning Characterization Plant for the BORAX-V Facility Site*, INEL-95/0598, Lockheed Martin Idaho Technologies Company, 1995.

Table 1-1 WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

										Evaluate as part of		Potentially Contaminated Media								OU 10-04 RI/FS Tasks to Resolve Data Gaps				Alternatives to be considered in the FS										
OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	BRA	ERA[e]	GW[f]	Surface Soil 0-6"	Subsurface Soil >6"	Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gaps	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	0	1	2	3	4a	4b	4c	5a	5b	6a	6b
WAG 6																																		
None	EBR-02	EBR-I Septic Tank (AEF-702) and Seepage Pit (AEF-703)	No Action	Preliminary Assessment	No Action	Tank removed during 1995 D&D action	Eliminate	No source remains. No Action under FFA/CO	--	--	--	--	--	--	--	None	None	None	N	None	None	No FS--NA	None	X										
None	EBR-03	EBR-I Seepage Pit (WMO-702)	No Action	Preliminary Assessment	No Action	Pit removed during 1995 D&D action	Retain	New data from D&D activity	Rad	X	X	X	--	X	--	Risk from residual manmade radionuclide contamination is undefined.	Risk from residual manmade radionuclide contamination is undefined.	None, No Source	N	Evaluate existing data.	Evaluate existing data.	None, No Source	None, No Source	X										
None	EBR-04	EBR-I Septic Tank (WMO-701)	No Action	Preliminary Assessment	No Action	Tank removed during 1995 D&D action	Retain	New data from D&D activity	Rad	X	X	X	--	X	--	Risk from residual manmade radionuclide contamination is undefined.	Risk from residual manmade radionuclide contamination is undefined.	None, No Source	N	Evaluate existing data.	Evaluate existing data.	None, No Source	None, No Source	X										
None	EBR-05	EBR-I Cesspool, Septic Tank (EBR-709) and Seepage Pit (EBR-713)	No Action	Preliminary Assessment	No Action	Active	Retain for facility assessment	No source remains. No Action under FFA/CO	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	EBR-06	EBR-I Septic Tank (EBR-714) and Seepage Pit (EBR-716)	No Action	Preliminary Assessment	No Action	Tank removed during 1995 D&D action	Eliminate	No source remains. No Action under FFA/CO	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-01	BORAX -02	BORAX-I Burial Site	Track 2	WAG 5 RI/FS, ROD, RD/RA	WAG 5 RD/RA	Capped 1996, additional surface soil radionuclide contamination was discovered in 1998.	Retain	New data from OU 5-05/6-01 RD/RA	Rad	X	X	X	--	X	X	Risk posed by residual radionuclide contamination is undefined.	Site has not been evaluated for ecological risk.	None	N	Evaluate existing data.	Evaluate existing data.	None	Evaluate existing data.	X	X	X								
6-02	BORAX 01	BORAX II-V Leach Pond	Track 1	Track 1	RI/FS, Inst Con	Pond inactive; contaminated soil buried under clean soil	Retain	Subsurface contamination present	Rad	X	X	X	--	X	X	Risk posed by residual radionuclide and metals contamination is undefined.	Risk posed by residual radionuclide and metals contamination is undefined.	None	N	Evaluate existing Track 1 data.	Evaluate existing Track 1 data.	None	None	X	X	X					X		X	
6-02	BORAX-03	BORAX AEF Septic Tank (AEF-703)	Track 1	Track 1	NFA	Tank removed during 1995 D&D action	Eliminate	No source remains. No Action under FFA/CO	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-02	BORAX-04	BORAX Trash Dump	Track 1	Track 1	NFA	Dump inactive; waste removed, area covered with clean fill and seeded	Eliminate	No source remains for human health. No Action under FFA/CO	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-02	BORAX 08	BORAX Ditch	New Site	Track 1, RI/FS, NTCRA	NTCRA	Soil removed during 1995 NTCRA	Retain	OU 10-06 NTCRA has not been reviewed a final action.	Rad	X	X	X	X	--	--	Risk posed by residual radionuclide and metals contamination is undefined.	Risk posed by residual radionuclide and metals contamination is undefined.	OU 10-06 NTCRA has not been reviewed as a final action	N	Evaluate existing OU 10-06 verification sampling data.	Evaluate existing OU 10-06 verification sampling data.	Evaluate existing data.	Evaluate existing data.	X	X									
6-02	BORAX-09	BORAX II-V	New Site	Track 1, D&D action	D&D, RI/FS	Filled with clean and radioactive soil during the 1996 D&D	Retain	New data from D&D activity	Rad, metals, organics	X	X	X	X	X	X	Risk posed by residual contamination is undefined.	Site has not been evaluated for ecological risk.	Availability of cover material (D&D cover has not been evaluated as a final action).	N	Evaluate existing data. Review recent D&D information and incorporate into overall risk assessment data.	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	X	X	X								
6-03	BORAX-05	BORAX Fuel Oil Tank, SW of AEF-602	Track 1	Track 1	NFA	UST removed during 1990 tank program	Eliminate	No pathway to ecological receptors for human health. Signed as No Further Action	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-03	BORAX-07	BORAX Inactive Fuel Oil Tank by AEF-601	Track 1	Track 1	NFA	UST removed during 1990 tank program	Eliminate	No pathway to ecological receptors. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-03	EBR-07	EBR-I (AEF-704) Fuel Oil Tank at AEF-603	Track 1	Track 1	NFA	UST removed during 1990 tank program	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-03	EBR-08	EBR-I (WMO-703) Fuel Oil Tank	Track 1	Track 1	NFA	UST removed during 1990 tank program	Retain	Subsurface TPH levels exceeded 1000 mg/kg	Organics	X	X	--	--	X	--	TPH levels have not been evaluated in risk assessment	Site has not been evaluated for ecological risk.	None	N	Evaluate existing data.	Evaluate existing data.	None	None	X	X									
6-03	EBR-09	EBR-I (WMO-704) Fuel Oil Tank at WMO-601	Track 1	Track 1	NFA	Tank removed during 1995 D&D	Retain	ERA required	Metals	--	X	--	--	X	--	None	Site has not been evaluated for ecological risk.	None	N	None	Evaluate existing Track 1 data.	None, No Source	None	X	X									
6-03	EBR-10	EBR-I (WMO 705) Gasoline Tank	Track 1	Track 1	NFA	UST removed during 1990 tank program	Retain	ERA required	Organics	--	X	--	--	X	--	None	Site has not been evaluated for ecological risk.	None	N	None	Evaluate existing Track 1 data.	None, No Source	None	X	X									
6-03	EBR-11	EBR-I Fuel Oil Tank (EBR-706)	Track 1	Track 1	NFA	UST removed during 1990 tank program	Retain	ERA required	Organics	--	X	--	--	X	--	None	Site has not been evaluated for ecological risk.	None	N	None	Evaluate existing Track 1 data.	None, No Source	None	X	X									
6-03	EBR-12	EBR-I Diesel Tank (EBR-707)	Track 1	Track 1	NFA	UST removed during 1990 tank program	Retain	ERA required	Organics	--	X	--	--	X	--	None	Site has not been evaluated for ecological risk.	None	N	None	Evaluate existing Track 1 data.	None, No Source	None	X	X									
6-03	EBR-13	EBR-I Gasoline Tank (EBR-708)	Track 1	Track 1	NFA	UST removed during 1990 tank program	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-03	EBR-14	EBR-I Gasoline Tank (EBR-717)	Track 1	Track 1	NFA	Unknown, the tank is unaccounted for	Eliminate	Tanks not located. Signed as No Further Action for human health	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
6-04	EBR-15	Radioactive Soil Contamination (EBR-I)	Track 1	Track 1, RI/FS, NTCRA	NTCRA (See BORAX-08)	Soil removed in 1995 NTCRA	Retain	New data from OU 10-06 NTCRA	Rad	X	X	X	X	X	--	Risk posed by residual radionuclide contamination is undefined.	Risk posed by residual radionuclide contamination is undefined.	Waste Area Criteria (WAC) Availability of cover material (OU 10-06 NTCRA has not been reviewed as a final action).	N	Evaluate existing OU 10-06 verification sampling data.	Evaluate existing OU 10-06 verification sampling data.	Evaluate existing data.	Evaluate existing data.	X	X	X					X		X	
6-05	--	WAG 6 Comprehensive RI/FS	RI/FS	--	--		Retain	Performed as part of OU 10-04 RI/FS	--	--	--	--	--	--	--	See sites retained above	See sites retained above	See sites retained above	N	See sites retained above	See sites retained above	See sites retained above	See sites retained above											
None	EBR-01	EBR-I Reactor Building Area (including HTRE)	--	--	--	Active as tourist attraction	Retain	Facility Assessment	Rad and asbestos	X	X	--	--	--	--	The potential risk posed after D&D is undefined.	The potential risk posed after D&D is undefined.	None, D&D actions are assumed to be adequate for CERCLA.	N	Evaluate existing data in Facility Assessment. Review and incorporate future D&D information.	Evaluate existing data.	None	None	X	X									

Table 1-1 WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	Evaluate as part of: BRA	Evaluate as part of: ERA[e]	Potentially Contaminated Media: GW[f]	Potentially Contaminated Media: Surface Soil 0-6"	Potentially Contaminated Media: Subsurface Soil >6"	Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gap	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	OU 10-04 RI/FS Tasks to Resolve Data Gaps: RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	Alternatives to be considered in the FS: 0	1	2	3	4a	4b	4c	5a	5b	6a	6b
WAG 10																																		
None	ARVFS-02	ARVFS Tank Containing Low-level Radioactive Waste (under white building)	No Action	Preliminary Assessment	No Action	Tank removed during 1989 D&D	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	DF-1	Dairy Farm Disposal Pit	No Action	Preliminary Assessment	No Action	Waste removed during 1989; pit inactive	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	BOCR-02	BOCR Injection Well	No Action	Preliminary Assessment	No Action	Never active	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	BOCR-03	BOCR Oxidation pond	No Action	Preliminary Assessment	No Action	Never active	Retain	Risks from potential asbestos and metal contamination in piping leading to the site has not been evaluated.	Asbestos, metals	X	X	--	--	X	X	Risk from contamination left in place is undefined	Risk from contamination left in place is undefined.	Nature and Extent WAC Cover material availability	N	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	X	X	X					X		X	
None	BOCR-04	BOCR Septic Tank	No Action	Preliminary Assessment	No Action	Inactive	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	ZPPR-01	ZPPR Disposal Pit (outside ANL-W fence)	No Action	Preliminary Assessment	No Action	Inactive	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	ARVFS-01	ARVFS Containers of Contaminated NaK	No Action	Preliminary Assessment	No Action	NaK removed during RCRA action 1995	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	BOCR-01	BOCR Leach Pond	No Action	Preliminary Assessment	No Action	Never active	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
None	BOCR-05	BOCR Blowdown Sump (BOCR-719)	No Action	Preliminary Assessment	No Action	Never active	Eliminate	No source remains. Signed as No Further Action for human health.	--	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X										
10-01	LCCDA-01	LCCDA Old Disposal Pit (west end)	Track 2	Track 2	RI/FS	Inactive, pit backfilled	Retain	Recommended in Track 2 for further evaluation in OU 10-04	Rad, metals, organics	X	X	X	X	X	X	Risk from residual contamination is undefined.	Risk from residual contamination is undefined.	Vapor plume has not been delineated (WAG 7 task)	N	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	X	X	X		X			X		X	
10-01	LCCDA-02	LCCDA Limestone Treatment and Disposal Pit (east end)	Track 2	Track 2	RI/FS	Inactive, pit backfilled	Retain	Recommended in Track 2 for further evaluation in OU 10-05	Rad, metals, organics	X	X	X	X	X	X	Risk from residual contamination is undefined.	Risk from residual contamination is undefined.	Vapor plume has not been delineated (WAG 7 task)	N	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	Evaluate existing data.	X	X	X		X			X		X	
10-02	OMRE-01	OMRE Leach Pond	Track 2	None	RI/FS	Inactive; pond backfilled	Retain	Track 2 Assessment has not been performed	Rad, organics	X	X	X	X	X	X	Soil and groundwater contamination is undefined. Risk from residual contamination is undefined.	Site has not been evaluated for ecological risk.	Nature and Extent Grain size distribution WAC Cover material availability	Y	Collect surface soil, subsurface soil, and ground water samples for Appendix IX VOCs, SVOCs, and PCBs TCLP. Evaluate data to be incorporated into risk assessment.	Collect surface soil, subsurface soil, and ground water samples for Appendix IX VOCs, SVOCs, and PCBs. Evaluate data to be incorporated into risk assessment.	Haz waste determination. Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X	X		X			X		X	
10-03+A71[k]		Ordnance Areas (including NODA)	Track 2	Track 2	RI/FS, Inst Con	Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds, metals, pesticides, PCBs, VOCs, rad	X	X	■	■	■	X	Summarize existing data and evaluate cumulative risk	OU has not been evaluated for ecological risk.			Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Contaminated Soils: Ex situ remediation (bioremediation), incineration Ordnance: Preferred Alternative - Institutional Controls												
10-04		WAG 10 Comprehensive RI/FS	RI/FS																															
10-04	STF-01[j]	STF-601 Sumps and Pits	RI/FS	None	--	New Site; D&D sample FY-1998	Retain		Asbestos, organics, rad	X	X	X	X	X	--	Risk posed by water in sumps and pits is undefined.	Risk posed by water in sumps and pits is undefined.	WAC Soil moisture Grain size distribution Soils beneath structure to be evaluated following completion of D&D activities.	N	Review sample analysis data collected by D&D program.	Review data collected by D&D program.	Evaluate existing data.	Evaluate existing data.	X	X			X			X		X	
10-04	STF-02[j]	STF Gun Range	RI/FS	None	--	New site	Retain		Lead, copper, creosote	X	X	X	X	X	X	Risk posed by lead and copper contaminated berm is undefined.	Risk posed by lead and copper contaminated berm is undefined.	Soil moisture Grain size distribution WAC (recycle lead to be evaluated) Nature and extent	Y	Review sample analysis data collected by D&D program.	Review data collected by D&D program.	Evaluate separating and recycling bullets, and railroad ties, grain distribution (Revise FSP to address data gaps)		X	X			X			X		X	
10-04	WAG 1	Test Area North	RI/FS	OU 1-10 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 2	Test Reactor Area	RI/FS	OU 2-13 RI/FS	RI/FS	ROD signed, RD/RA in progress	Retain	Comprehensive aquifer and ecological evaluation needed	Rad, metals	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 3	ICPP	RI/FS	OU 3-13 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	Rad, metals	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 4	Central Facilities Area	RI/FS	OU 4-13 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	Metals, organics	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 5	ARA/PBF	RI/FS	OU 5-12 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	Rad, metals	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 7	Radioactive Waste Management Complex	RI/FS	OU 7-13/14 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	Rad, organics, metals	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 8	Naval Reactors Facility	RI/FS	OU 8-08 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	--	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-04	WAG 9	Argonne National Laboratory-West	RI/FS	OU 9-04 RI/FS	RI/FS	In progress	Retain	Comprehensive aquifer and ecological evaluation needed	--	X	X	X	X	X	--	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	N	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	See detail in Aquifer and Ecology	X	X	X					X		X	
10-05[k]		Ordnance Interim Action (including OU 4-01)	Interim Action	IA	RI/FS	Ordnance removed	Retain		UXO explosive compounds	X	X	--	X	X	X		Site has not been evaluated for ecological risk.		N		Evaluate existing data.	See OU 10-03		X	X									
10-06[l]	EBR WB, BORAX WB	Radionuclide-Contaminated Soils	RI/FS	NTCRA	RI/FS	Inactive radionuclide-contaminated soil removed	Retain		Rad, metals	X	X	--	X	--	--	Cumulative risk is undefined	Cumulative risk is undefined		N		Review OU 10-06 data in the OU 10-04 RI/FS.		None	X	X									
10-07[l]		Telecommunications Cable	Track 1	Track 1	NFA	Inactive	Retain		Metals	--	X	--	--	X			Site has not been evaluated for ecological risk.		N		Evaluate existing data.		None	X	X									

Table 1-1. WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	Evaluate as part of: BRA	Evaluate as part of: ERA[e]	Potentially Contaminated Media: GW[f]	Potentially Contaminated Media: Surface Soil 0-6"	Potentially Contaminated Media: Subsurface Soil >6"	Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gaps	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	OU 10-04 RI/FS Tasks to Resolve Data Gaps: RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	Alternatives to be considered in the FS: 0	1	2	3	4a	4b	4c	5a	5b	6a	6b
10-03	ORD-01	Arco High Altitude Bombing Range	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-02	Naval Ordnance Test Facility (NOTF)	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-03	CFA-633 Naval Firing Site and Downrange Area	Track 2/ Interim Action	Track 2/Interim Action	RI/FS, Inst Con	No UXO found but TNT-soil contamination removed in 1993 IA/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate interim action as the final action	Evaluate interim action as the final action	X	X									
10-03	ORD-04	CFA Gravel Pit	Track 2/ Interim Action	Track 2/Interim Action	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate interim action as the final action	Evaluate interim action as the final action	X	X									
10-03	ORD-05	CFA Sanitary Landfill Area	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate removal action as the final action	Evaluate removal action as the final action	X	X									
10-03	ORD-06	Naval Ordnance Disposal Area (NODA) grid	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	UXO removed in 1994, 1995, and 1997 NTCRAs. Verified TNT-soil contamination remains in craters/Institutionally Controlled	Retain	Potential UXO and verified TNT-soil contamination at site. Evaluate residual risk.	UXO explosive compounds, metals, TPH, nitrites, and nitrates, total phosphorus picric acid, PCBs, pesticides, VOCs, and SVOCs.	X	X	--	X	X	X	20 acres have high potential of UXO. The presence and concentration of nitroaromatic contamination in the craters is unknown. The fuel stained soil found on the southeast corner needs to be evaluated.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture WAC Grain size distribution (20 acres remain to be cleared of UXO. The presence and concentration of contamination in the craters is unknown. The fuel stained soil found on the southeast corner needs to be evaluated.)	Y	Resolve UXO issue. Collect surface soil and subsurface soils samples for nitroaromatics metals, TPH, nitrites, and nitrates, total phosphorus picric acid, PCBs, pesticides, VOCs, and SVOCs.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X		X	X	X
10-03	ORD-07	Explosive Storage Bunkers - North of ICPP	Track 2/ Interim Action	Track 2/Interim Action	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	The risk posed by potential ordnance or contaminated soil beneath the collapsed bunker and associated concrete slab is undefined.	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Perform qualitative risk assessment.	Summarize existing data and evaluate cumulative risk	Evaluate interim action as the final action	Evaluate interim action as the final action	X	X									
10-03	ORD-08	National Oceanic & Atmospheric Administration (NOAA) Grid	Track 2/ Interim Action/ NTCRA	Track 2/Interim Action/NTCRA	RI/FS, Inst Con	UXO removed in 1993 IA and 1997 NTCRA/Institutionally Controlled	Retain	TNT soil contamination remains at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture (It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.)	Y	Collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X				
10-03	ORD-09	Twin Buttes Bombing Range	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	No UXO found/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate removal action as the final action	Evaluate removal action as the final action	X	X									
10-03	ORD-10	Firestation II Zone & Range Fire Burn Area	Track 2/ Interim Action. NTCRA	Track 2/Interim Action/NTCRA	RI/FS, Inst Con	No UXO found but soil contamination and pieces of TNT removed in 1993 IA and 1997 NTCRA/Institutionally Controlled	Retain	Potential TNT-soil contamination may remain at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture (It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.)	Y	Collect surface soil and subsurface soil samples for nitroaromatics	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X				
10-03	ORD-11	Anaconda Power Line	Track 2/ Interim Action	Track 2/Interim Action	RI/FS, Inst Con	UXO removed in 1993 IA/Institutionally Controlled	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X		--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate interim action as the final action	Evaluate interim action as the final action	X	X									
10-03	ORD-12	Old Military Structures	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-13	Mass Detonation Area	Track 2	Track 2	RI/FS, Inst Con	Extremely high potential for UXO to remain at this site. Surface UXO removed during IA and NTCRAs however, removal unfinished/Institutionally Controlled.	Retain	Potential UXO and TNT soil contamination may remain at site. Evaluate residual risk	UXO explosive compounds	X	X		X	X	X	100 acres remain to be cleared of UXO. 506 acres surrounding the site require additional characterization. The presence and concentration of nitroaromatics in the craters is unknown.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture WAC (100 acres remain to be cleared of UXO. 506 acres surrounding the site require additional characterization. The presence and concentration of nitroaromatics in the craters is unknown.)	Y	After UXO remediation, collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X		X	X	X
10-03	ORD-14	Dairy Farm Revetments	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-15	Experimental Field Station (EFS)	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	UXO removed during 1996 TCRA/TNT-soil contamination remains at site/Institutionally Controlled.	Retain	Verified TNT-soil contamination remains at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	Results of planned bioremediation are unknown	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture (Results of planned bioremediation are unknown.)	Y	Collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X				
10-03	ORD-16	UXO East of TRA	Track 2/ TCRA	Track 2/TCRA	RI/FS, Inst Con	UXO removed during 1996 TCRA. Potential TNT soil contamination may remain at site/Institutionally Controlled	Retain	Potential TNT-soil contamination may remain at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH WAC Soil moisture (It is unclear whether a surface clearance of just the chunk TNT will be sufficient to clear the site or if the remaining soil contamination will be above the cleanup levels.)	Y	Collect surface soil and subsurface soil samples for nitroaromatics	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X				
10-03	ORD-17	Burn-Ring South of EFS	Track 2	Track 2	RI/FS, Inst Con	No UXO found. Potential uncharacterized soil contamination remains within the ring/Institutionally Controlled.	Retain	Potential undetermined soil contamination remains at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	The type and extent of contamination in the ring is unknown.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture (The type and extent of contamination in the ring is unknown.)	Y	Collect surface soil and subsurface soil samples for nitroaromatics CLP metals, TPH, PAHs, PCBs, VOCs and SVOCs.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X				X	X				
10-03	ORD-18	Igloo Type Structures Northwest of EFS	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X		X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-19	Rail Car Explosion Area	Track 2/ TCRA/ NTCRA	Track 2/TCRA/NTCRA	RI/FS, Inst Con	High potential for UXO to remain at site. UXO removed from surface and subsurface during 1996 TCRA and 1997 NTCRA. Removal unfinished/Institutionally Controlled.	Retain	Potential UXO and RDX-soil contamination may remain at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	X	20 acres remain to be cleared of UXO. 234 acres surrounding the site require characterization. Potential exists for soil contamination.	Site has not been evaluated for ecological risk	Nature and Extent Soil pH Soil moisture WAC (20 acres remain to be cleared of UXO. 234 acres surrounding the site require characterization. Potential exists for soil contamination.)	Y	Resolve UXO issue. Collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X		X	X	X
10-03	ORD-20	UXO East of ARVFS	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-21	Juniper Mine	Track 2	Track 2	RI/FS, Inst Con	16,000 lbs UXO remain buried 135 ft/ Institutionally Controlled.	Retain	Evaluate residual risk	Nitrates, UXO explosive compounds	X	X	X	X	--	--	The potential for ground water contamination has not been evaluated.	Site has not been evaluated for ecological risk	More information is needed on type and management of potential institutional controls.	Y	Perform ground water risk assessment.	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-22	Projectiles Found Near Mile Markers 17 and 19	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	UXO removed 1993 IA and 1994 NTCRA/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate removal actions as the final action	Evaluate removal actions as the final action	X	X									
10-03	ORD-23	Rifle Range	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-24	Land Mine Fuze Burn Area	Track 2/ TCRA/ NTCRA	Track 2/ TCRA/NTCRA	RI/FS, Inst Con	UXO removed 1996 TCRA and 1997 NTCRA. Removal unfinished/Institutionally Controlled.	Retain	UXO and potential undetermined soil contamination remain at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	X	One acre remains with identified UXO. The average concentration of nitroaromatic contamination is unknown.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture WAC One acre remains to be cleared of UXO. The extent and concentrations of nitroaromatic are unknown.	Y	Resolve UXO issue. Collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X		X	X	X
10-03	ORD-25	Ordnance & Dry Explosives East of the Big Lost River (This site is the same site as ORD-19)	NA	NA	NA	NA	Eliminate site ORD-25 but retain site ORD-19	Site ORD-25 and ORD-19 are the same site									Site has not been evaluated for ecological risk.		N		None	None	None	X										
10-03	ORD-26	Zone East of the Big Lost River	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-27	Dirt Mounds Near the EFS, NOAA, and NRF	Track 2	Track 2	RI/FS, Inst Con	No UXO found/Institutionally Controlled.	Retain	Evaluate residual risk	UXO explosive compounds	X	X	--	X	--	--	Cumulative risk is undefined	Site has not been evaluated for ecological risk.	More information is needed on type and management of potential institutional controls.	Y	Summarize existing data and evaluate cumulative risk	Summarize existing data and evaluate cumulative risk	Evaluate Track 2 assessment as the final action	Evaluate Track 2 assessment as the final action	X	X									
10-03	ORD-28	Craters East of ICPP	Track 2/ NTCRA	Track 2/NTCRA	RI/FS, Inst Con	UXO removed 1997 NTCRA/Institutionally Controlled.	Retain	Potential for TNT-soil contamination may remain at site. Evaluate residual risk	UXO explosive compounds	X	X	--	X	X	--	Verification samples for nitroaromatics were not collected after the 1997 removal action.	Site has not been evaluated for ecological risk.	Nature and Extent Soil pH Soil moisture WAC Verification samples for nitroaromatics were not collected after the 1997 removal action.	Y	Collect surface soil and subsurface soil samples for nitroaromatics.	Summarize existing data and evaluate cumulative risk	Evaluate new characterization data and existing data	Evaluate new characterization data and existing data	X	X		X	X	X	X				
10-03	ORD-29	Big Southern Butte	NA	NA	NA	Documentation provided in Appendix N proves that no live rounds were fired.	Eliminate	No live rounds were fired	Inert metal casings	--	--	--	--	--	--	None	None	None	N	None	None	None	None	X	X									

Table 1-1 WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

										Evaluate as part of		Potentially Contaminated Media									OU 10-04 RI/FS Tasks to Resolve Data Gaps			Alternatives to be considered in the FS										
OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	BRA	ERA[e]	GW[f]	Surface Soil 0-6"	Subsurface Soil >6"	Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gaps	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	0	1	2	3	4a	4b	4c	5a	5b	6a	6b
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	--	Migrating contaminant plumes	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	See detail below	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	See detail below for Aquifer	None	Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	The impact from Big Lost River recharge is undefined (e.g., flow reversals, lateral spreading of perched water beneath RWMC or ICPP may enhance contamination migration.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Review planned monitoring of water level and contaminant for WAGs 3 and 7 COPCs.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	The influent water quality for INEEL boundaries has not been established (i.e., contaminants from other sources.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Assemble existing background data set for Post ROD ground water monitoring plan.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	Evaluate and track contaminant concentrations to verify accuracy of predictive ground water models. Consistent data set required for Post-ROD monitoring.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Perform trend analysis on water quality data.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	INEEL-wide ground water flow is inconsistent between WAGs and impact of fast-flow paths on contamination migration has not been determined.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Summarize recent isotopic geochemistry analyses and design a Site-wide strategy for the collection of isotopic and water quality data to ensure adequate "safety net" exists for INEEL. Define reactive hydrochemistry relations for INEEL with respect to travel times and flowpaths.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	Determine possible commingling of INTEC, TRA, and RWMC plumes.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Review vapor port data in RWMC upgradient well for source delineation. Review data from new wells drilled by WAG 7 results of WAG 7 RI and review WAG 3 RI.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	Vertical distribution of plumes downgradient of TRA/INTEC are undefined.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Review data from new wells drilled by WAG 7 and other wells in WAGs 3 and 7. Consider vertical and temporal distribution in risk analysis.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									
10-04	Aquifer	Snake River Plain Aquifer	RI/FS	None	None	Institutionally Controlled	Retained	Comprehensive aquifer and ecological evaluation needed	Organics, rad, metals	X	--	X	--	--	--	Impact of how the INEEL contamination on aquifer as a whole is undefined.	None	None, Preferred Alternative: Institutional Controls with Monitoring	N	Provide summary of contamination for the INEEL boundary and beyond as necessary to encompass real or potential impacts form INEEL activities and any areas within the INEEL not covered by other WAGs.	None	None, Preferred Alternative: Institutional Controls with Monitoring	None	X	X									

Table 1-1 WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	Evaluate as part of: BRA	Evaluate as part of: ERA[e]	Potentially Contaminated Media: GW[f]	Potentially Contaminated Media: Surface Soil 0-6"	Potentially Contaminated Media: Subsurface Soil >6"	Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gaps	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	OU 10-04 RI/FS Tasks to Resolve Data Gaps: RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	Alternatives to be considered in the FS: 0	1	2	3	4a	4b	4c	5a	5b	6a	6b
		STP Area	–	–	–	Inactive; 1989 D&D	Retain	Facility Assessment	Organics, rad, metals, asbestos	X[f]	X[f]					The potential cumulative risk posed after D&D is undefined.	The potential cumulative risk posed after D&D is undefined.	None. D&D actions are assumed to be adequate for CERCLA.	N	Review and incorporate recent D&D information. Evaluate existing data.	Evaluate existing data in Facility Assessment. Review and incorporate recent D&D information.	None	To be determined	–	–									
																							To be determined											
10-04	Ecology	Site-wide Ecological Areas																					To be determined											
10-04	Ecology	Sites at WAGs 6, 7, 8, and 10															Lack of biological surveys of sites of concern for WAGs 6, 7, 8, and 10.			A survey will be scheduled with an assigned WAG project manager and conducted in FY 98. Surveys will incorporate protocols used in other WAG surveys and the results will be compiled and documented for use in the OU 10-04 ERA. No survey will be conducted for WAG 8. Existing information will be substituted.			To be determined											
10-04	Ecology	Sites at WAGs 6, 7, 8, and 10															Lack of area surveys for WAG 10 (T/E and species of concern).				Area surveys will be completed by the ESRF in FY-99 using protocols previously documented by the ESRF.		To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Laboratory results of ecotoxical and deer-mice samples collected during the 1997 field season pending analysis.				Review data.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Data validation and statistical evaluation of the 1997 data.				Data will be validated as laboratory analyses are completed. A preliminary statistical evaluation of data received to date is available in Appendix D.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	WAGs 4, 5, 6, 7, and 10															Draft WAG ERAs for WAGs 4, 5, 6, 7, and 10 need to be finalized.				WAGS 4 and 5 ERAs will be conducted as part of the WAG activity -WAG 7 will not perform an ERA, but will assess ecological receptors later in the CERCLA process. The ERAs for WAGs 6 and 10 will be performed to support the OU 10-04 ERA Problem formulation and will be presented in the OU 10-04 ERA.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															ERA summary for WAGs 1, 4, 5, 6, 7, 8, 9, and 10 are undeveloped.				WAGS 1, 4, 5, 6, 9, and 10 ERA results will be summarized as discussed in Appendix D. WAGs 7 and 8 assessments were conducted using different methodologies. The results for WAGs 7 and 8 will be included in the OU 10-04 assessment as qualitative discussions.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															GIS maps and analyses for additional species of concern are not available.				Conduct Steps 2 and 3 of process described in Appendix C2-4.1 for other species to be evaluated in the ERA. GIS maps of receptor distribution in the assessment area will be used in conjunction with the GIS maps of the contamination extent and concentrations to calculate exposure for the analysis.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Regional population data for species are not available.				Compile relative density values from literature and GIS analyses (no plan to fill-- see Appendix C2-4.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Verification of Breeding Bird Survey data collection point coordinates is not undeveloped.				Collect GPS locations from the field.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															COPC list for OU 10-04 is undeveloped.				Summaries from WAG ERAs will be used to develop a COPC list for OU 10-04. This list will be refined (reduced) as discussed in Appendix D1.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Concentration profiles and spatial extent for contaminants outside the WAG boundaries and for WAGs 6 and 10 sites are undeveloped.				The OU 10-06 and ESRF data will be used to develop an assessment area outside of the WAG boundaries. Contaminant concentrations in assessment areas will be extrapolated existing data for from similar contaminants (i.e., radionuclides to metals and organic compounds). Existing data collected for human health activities will be used to characterize the spatial extent and concentrations of contaminants at WAGs 6 and 10 sites.	Evaluate existing data	To be determined											
10-04	Ecology	Site-wide Ecological Areas															GIS maps of the concentration profiles and spatial extent for COPCs to be evaluated in the OU 10-04 ERA are not available.				Contaminant spatial content and concentration for OU 10-04 COPCs will be developed for GIS analyses. GIS maps of receptor distribution in the assessment area will be used in conjunction with the GIS maps of the contaminations extent and concentrations to calculate exposure for the analysis.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Characterization of contaminant extent in soil, sediment and water in the Big Lost River drainage is not available.				No sampling data will be collected based on historic and process knowledge and information, these sites are not expected to be contaminated. This will be discussed qualitatively in the ERA.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															ESRF study evaluation and dose reconstruction for use in the OU 10-04 ERA is undeveloped.				The ESRF studies will be further evaluated for use in the OU 10-04 ERA. A dose from radionuclides to receptors will be calculated and presented. The information will be used in conjunction with the 1997 biotic sampling data to verify foodweb models used in the WAG ERAs and to refine these models for the exposure modeling used in OU 10-04. The ESRF has collected information on the concentrations of radionuclides in biota at the INEEL and evaluated the sources of this contamination. This information will provide input to back-calculate biotic tissue concentrations for INEEL receptors and to verify the WAG ERA foodweb models. The information will also be used to refine the WAG assessment area extent and concentration.	Evaluate existing data	To be determined											
10-04	Ecology	Site-wide Ecological Areas															GIS maps of ESRF data summaries are not available.				Existing data will be converted to the GIS format and entered into the GIS system to support development of contaminant isopleths.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Toxicity reference values for newly identified contaminants are undeveloped.				Toxicity reference values will remain a data gap throughout the risk assessment process. TRVs will need to be developed for previously unidentified contaminants as discussed in Appendix D4. Additional information on the toxicity of a contaminant to ecological receptors needs to be incorporated into existing TRVs as it becomes available.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Plant Uptake Factors and/or Bioaccumulation Factors for previously unidentified COPCs are undeveloped.				Literature search will be performed and/or use of allometric equations as discussed in Appendix D3.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															1997 biotic sampling data is unevaluated.				1997 biotic sampling data will be statistically evaluated and compared to literature values used in the WAG ERA calculations. This will be documented in the OU 10-04 ERA.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Laboratory Directed Research Development plant uptake results are unevaluated.				1997 LDRD results will be evaluated and compared to literature based PUF values used in the WAG ERA calculations-W142s. This will be documented in the OU 10-04 ERA.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Refined receptor diet composition is undeveloped.				The need for specific dietary components developed from available literature is contingent on the final exposure model selection (Appendix C2).	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Contaminant/receptor specific input values to calculate exposure from dermal pathway is undetermined.				When OU 10-04 ERA COPCs and receptors of concern are identified and determined to have a significant dermal pathway, input values will be developed as discussed in Appendix D.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Contaminant/receptor specific input values to calculate exposure from inhalation pathway is undetermined.				When OU 10-04 ERA COPCs and receptors of concern are identified and determined to have a significant inhalation pathway, input values will be developed as discussed in Appendix D.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Pathway and exposure modeling verification and refinement are undetermined.				Evaluation of ESRF data and the 1997 sampling data to develop biotic tissue concentrations (exposure) for sampled receptors and contaminants. This information will be used to verify and refine the food web and exposure models used in the OU 10-04 ERA process.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															TRV development methodologies to assess the value of using a less conservative or different approach are unevaluated.				Discussion of various TRV development methodologies and presentation of results using different approaches.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															OU 10-04 contaminant extent and concentrations are undetermined.				See Appendix C2-4 for detailed description of required activity.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Regional population data for species are not available.				No sampling or literature searches will be performed.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															Contaminant characterization for INEEL natural surface water systems is not available.				The OU 10-04 ERA will assume that no contamination to INEEL natural surface water resources has occurred. This assumption will not be verified with sampling. Verification of this assumption will use existing studies and literature in a qualitative discussion.	Evaluate existing data	To be determined	X	X	X								

Table 1-1 WAGs 6 and 10 Sites (Listed in order of FFA/CO, 1991)

OU	Site Code	Site Description	FFA/CO Action Proposed	Previous FFA/CO Documentation	Previous Recommendations[a]	Status	Eliminate or Retain in OU 10-04 RI/FS[b]	Justification for Retention or Elimination[c]	COPCs[d]	Evaluate as part of: BRA	Evaluate as part of: ERA[e]	Potentially Contaminated Media: GW[f]	Potentially Contaminated Media: Surface Soil 0-6"	Potentially Contaminated Media: Subsurface Soil >6"	Potentially Contaminated Media: Debris[g]	OU 10-04 RI BRA Data Gap	OU 10-04 RI ERA Data Gaps	OU 10-04 FS BRA Data Gap	Requires New Data[h] (Y/N)	OU 10-04 RI/FS Tasks to Resolve Data Gaps: RI Tasks for BRA	RI Tasks for ERA	RI Tasks for Human Health FS Issues	RI Tasks for Ecological FS Issues	Alternatives to be considered in the FS: 0	1	2	3	4a	4b	4c	5a	5b	6a	6b
10-04	Ecology	Site-wide Ecological Areas															OU 10-04 assessment endpoints are undeveloped.				The assessment endpoints can be developed when one following tasks are performed: (a) finalize contaminant extent (assessment area) and concentration maps, (b) describe ecological setting, (c) determine presence of rare and endangered species, (d) determine exposure pathways, (e) evaluate new and existing data, (f) finalize COPC list for OU 10-04, and (g) identify receptors.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas															INEEL-specific fate and transport information for COPCs is undeveloped.				Perform literature search.	Evaluate existing data	To be determined	X	X	X								
10-04	Ecology	Site-wide Ecological Areas																			Resolve or consider identified agency comments prior to the development of the OU 10-04 ERA. (This includes OU 10-04 approach and WAG-specific ecological concern comments that were identified in Appendices C and D.	Evaluate existing data	To be determined	X	X	X								

a. Previous decisions considered human health risks only, with the exception of 10-06.
b. It is assumed USTs will not have to be reevaluated per the RCRA guidance.
c. Further rationale for retaining or eliminating sites for the OU 10-04 BRA can be found in Appendix C1.
d. Further detail for COPCs for the OU 10-04 BRA can be found in Appendix C1.
e. The ERA is considered part of the BRA, but it is separated here to identify risk assessment responsibilities. Sites were screened in the preliminary site screening for ecological receptors.
f. GWSCREEN runs will be performed at the WAGs 6 & 10 site level, cumulative GW impacts will be assessed at WAG level for all INEEL WAGs.
g. Material left in place.
h. The FSPs in Appendices F, G, and L detail the new data to be collected.
i. New site added since the 1991 FFA/CO.
j. Site codes have been assigned since the 1991 FFA/CO.
k. Sites were addressed as part of OU 10-05.
l. Facility assessment will be a qualitative or semiquantitative assessment in the BRA and ERA.
0 - No Action.
1 - Institutional Controls.
2 - Containment (capping).
3 - In Situ Treatment.
4a - Ex Situ Treatment.
4b - Bioremediation.
4c - Excavation and Off-Site Incineration.
5a - Excavation/disposal On-Site.
5b - Removal/On-Site detonation/Disposal On-Site of detonated ordnance.
6a - Excavation/disposal Off-site (waste certification requirements).
6b - Removal/On-Site detonation/Off-site disposal recycling Off-Site of ordnance detonate.
Acronyms.
TR - Tank Removed
NFA - No Further Action

2. SITE BACKGROUND AND PHYSICAL SETTING

This section describes the regional and local physiography, meteorology, geology, and hydrology of the OU 10-04 study area. Also described are the WAGs 6 and 10 sites history and status. As previously mentioned, however, recently identified sites–namely potential ordnance areas–would likely become part of WAGs 6 and 10 if accepted as new CERCLA sites in the NSIF process. As much information as possible would be included in this work plan for these new sites before it becomes final.

2.1 Physiography

The Snake River Plain (SRP) is the largest continuous physiographic feature in southern Idaho (Figure 2-1). This large topographic depression extends from the Oregon border across southern Idaho to Yellowstone National Park and northwestern Wyoming.

The SRP slopes upward from an elevation of about 750 m (2,500 ft) at the Oregon border to more than 1,500 m (5,000 ft) at Ashton northeast of the INEEL. The East and Middle buttes have elevations of 2,003 and 1,949 m (6,572 and 6,394 ft), respectively. The SRP is composed of two structurally dissimilar segments, with the division occurring between the towns of Bliss and Twin Falls, Idaho. West of Twin Falls, the Snake River has cut a valley through tertiary basin fill sediments and interbedded volcanic rocks. The stream drainage is well developed, except in a few areas covered by recent thin basalt flows. East of Bliss, Idaho, the complexion of the plain changes as the Snake River locally carves a vertical-walled canyon through thick sequences of quaternary basalt with few interbedded sedimentary deposits.

The INEEL is located on the northern edge of the eastern SRP (ESRP), a northeastern-trending basin, 80 to 110 km (50 to 70 mi) wide, extending from the vicinity of Bliss on the southwest to the Yellowstone Plateau on the northeast (Figure 2-1). Three mountain ranges end at the northern and northwestern boundaries of the INEEL: (1) the Lost River Range, (2) the Lemhi Range, (3) and the Beaverhead Mountains of the Bitterroot Range (Figure 2-1). Between the ranges and the relatively flat plain is a relief of 1,207 to 1,408 m (3,960 to 4,620 ft) (Hull 1989). Saddle Mountain, near the southern end of the Lemhi Range, reaches an altitude of 3,295 m (10,810 ft) and is the highest point in the immediate INEEL area.

The portion of the SRP occupied by the INEEL may be divided into three minor physiographic provinces. The first province is a central trough, often referred to as the Pioneer Basin, that extends to the northeast through the INEEL. Two flanking slopes descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast. The slopes on the northwestern flank of the trough are mainly alluvial fans originating from sediments of Birch Creek and the Little Lost River. Also forming these gentle slopes are basalt flows that have spread onto the plain. The land forms on the southeast flank of the trough are formed by basalt flows, which spread from a volcanic zone that extends northeastward from Cedar Butte. The lavas that erupted along this zone built up a broad topographic swell directing the Snake River to its current course along the southern and southeastern edges of the plain (Figure 2-2). This topographic swell effectively separates the drainage of mountain ranges northwest of the INEEL from the Snake River.

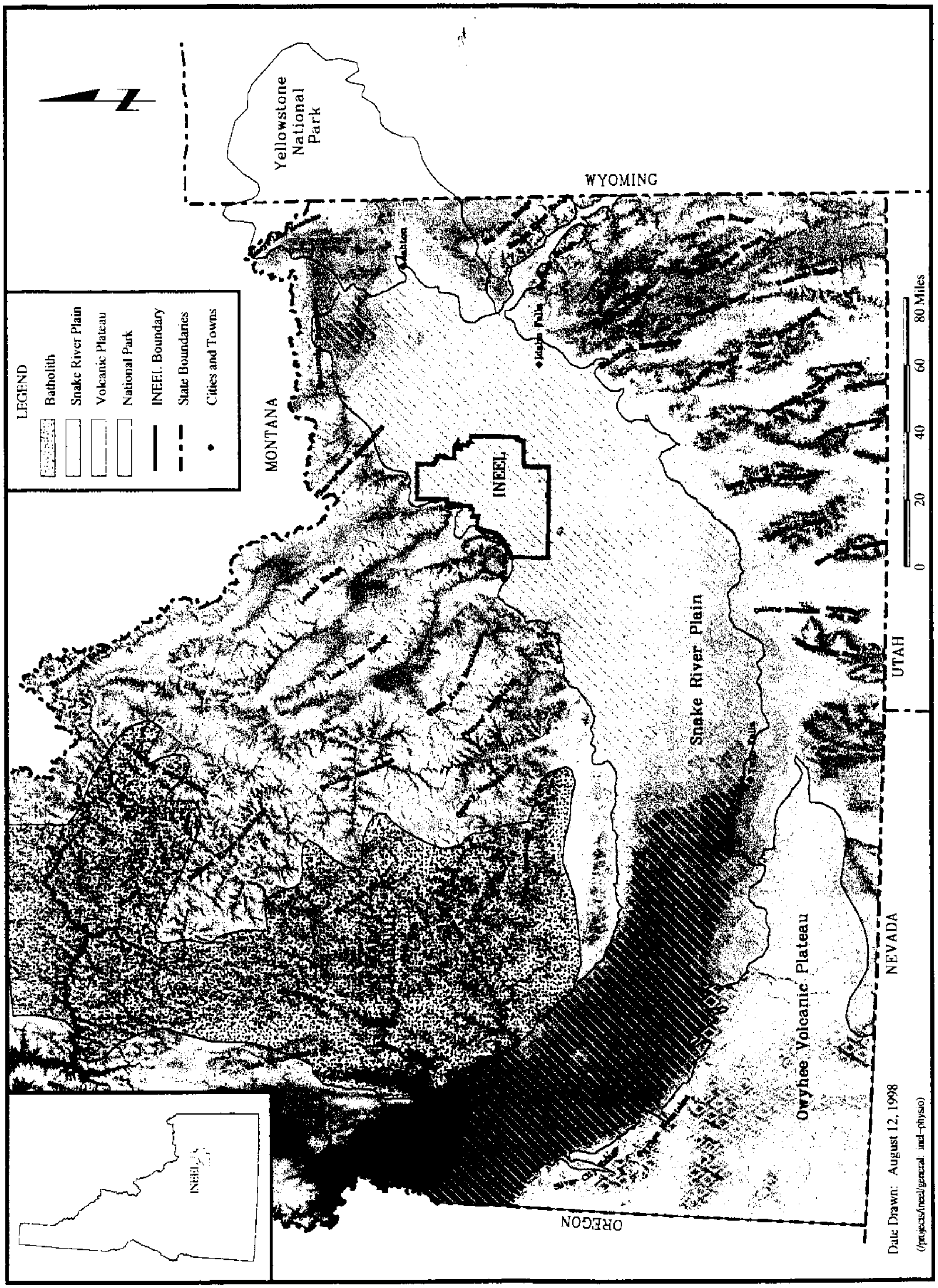


Figure 2-1. Physiographic and geologic features of the INEEL Area.

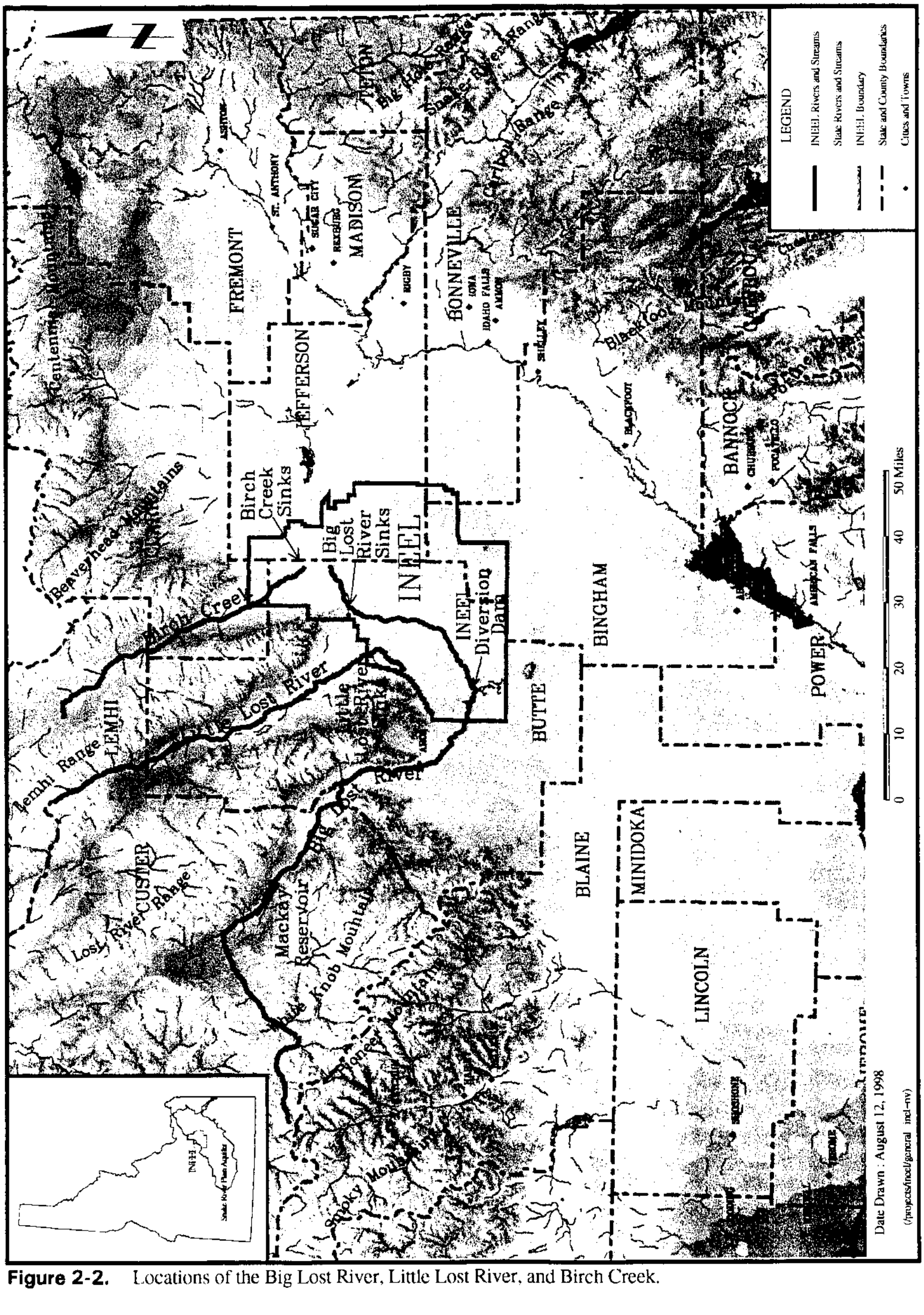


Figure 2-2. Locations of the Big Lost River, Little Lost River, and Birch Creek.

The Pioneer Basin of the INEEL broadens to the northeast and joins the extensive Mud Lake Basin. The Big and Little Lost Rivers and Birch Creek drain into this basin from valleys between the mountains to the north and west. The intermittently flowing waters of the Big Lost River have formed a flood plain in this trough, consisting primarily of fine sands, silt, and clay. Streams flow to the Big Lost River and Birch Creek sinks, a system of playa depressions in the west-central portion of the INEEL, southeast of the town of Howe, Idaho. The sinks area covers several hundred acres and is flat, consisting of significant thicknesses of fluvial and lacustrine (lake) sediments.

2.2 Meteorology

Atmospheric transport of contaminants is controlled by the following physical parameters: particle size, climate, local meteorology, local topography and large structures or buildings on-Site, and contaminant source strength. This subsection describes the aspects of the natural phenomena and physical parameters that are necessary to evaluate environmental and human health impacts from atmospheric transport of contaminants from WAGs 6 and 10 sites.

2.2.1 Climate

The National Oceanic and Atmospheric Administration (NOAA) and its predecessor have operated meteorological observation programs at the INEEL since 1949. The NOAA staff makes a full range of hourly and daily meteorological observations. As of June 1, 1993, 30 meteorological observation stations were in operation at or surrounding the INEEL. Three stations are equipped to measure wind speed and air temperature at multiple levels up to 76 m (250 ft) above the ground. These three towers are located at CFA, Argonne National Laboratory-W (ANL-W), and the Test Reactor Area (TRA). Atmospheric humidity is recorded at CFA and ANL-W. The precipitation and air temperature at the 1.5-m (5-ft) level are recorded at CFA.

A station at TRA has been operational since 1971 and is used to measure windspeed and direction 15 m (50 ft) above the ground. A primary observation station, Grid 3 (GRD3), is located approximately 5 km (3 mi) east-northeast of the TRA station. The GRD3 station was put into service in 1957 and is used to measure windspeed and direction at multiple levels. Since 1979, air temperature at multiple levels also has been recorded at the station. The longest and most complete record of meteorological observations exists for the CFA station. Most of the information presented in this section is summarized from a 1989 climatography report map of the INEEL (Clawson et al. 1989), which compiled weather recordings for the period from 1949 to 1988. Air mass characteristics, proximity to moisture sources, the angle of solar incidence, temperature, and other effects caused by latitude differences would be expected to be similar for all locations at the INEEL; therefore, extrapolation of meteorological data from CFA to other locations at the INEEL is possible (Bowman et al. 1984).

The climate at the INEEL is influenced by the regional topography and upper-level wind patterns over North America. The Rocky Mountains and the SRP help to create a semiarid climate with an average summer-daytime maximum temperature of 28°C (83°F) and an average winter-daytime maximum temperature of -0.5°C (31°F). Infrequent cloud cover over the region allows intense solar heating of the ground surface during the day, and the low absolute humidity allows significant radiant cooling at night. These factors create large temperature fluctuations near the ground (Bowman et al. 1984). During a 22-year period of meteorological records (1954 through 1976), temperature extremes at the INEEL have varied from a low of -41°C (-43°F) in January to a high of 39°C (103°F) in July (Clawson et al. 1989).

2.2.2 Local Meteorology

The average relative humidity at the INEEL ranges from a monthly average minimum of 15% during August to a monthly average maximum of 81% during February and December. The relative humidity is related to diurnal temperature fluctuations. Relative humidity generally reaches a maximum just before sunrise (the time of lowest temperature) and a minimum in the late afternoon (time of maximum daily temperature) (Vandeusen and Trout 1990).

The average annual precipitation at the INEEL is 21.5 cm (8.5 in). The months with the highest precipitation rates are May and June, and the month with the lowest is July. Snowfall at the INEEL ranges from a low of about 30.5 cm (12 in.) per year to a high of about 102 cm (40 in.) per year, with an annual average of 66 cm (26 in.). Normal snowfall occurs from November through April, though occasional snowstorms occur in May, June, and October (Vandeusen and Trout 1990).

A statistical analysis of precipitation data from CFA for the period from 1950 through 1990 was made to determine estimates for the 25- and 100-year maximum 24-hour precipitation amounts and 25- and 100-year maximum snow depths (Sagendorf 1991). Results from this study indicate 3.43 cm (1.35 in.) of precipitation for a 25-year, 24-hour storm event, and 4.1 cm (1.6 in.) of precipitation for a 100-year, 24-hour storm event. The 25-year maximum snow depth is 57.4 cm (22.6 in.), and the 100-year maximum snow depth is 77.8 cm (30.6 in.) (Sagendorf 1991).

Potential annual evaporation from saturated ground surface at the INEEL is approximately 91 cm (36 in.). Eighty percent of this evaporation occurs between May and October. During the warmest month (July), the potential daily evaporation rate is approximately 0.63 cm/day (0.25 in./day). During the coldest months (December through February), evaporation is low and may be insignificant. Transpiration by native vegetation on the INEEL approaches the total annual precipitation input. Potential evapotranspiration is at least three times greater than actual evapotranspiration (Kaminsky et al. 1993).

The local topography, mountain ranges, and large-scale weather systems influence the local meteorology. The orientation of the bordering mountain ranges and the general orientation of the ESRP play an important role in determining the wind regime. The INEEL is in the belt of prevailing westerly winds, which are normally channeled across the ESRP. This channeling usually produces a west-southwesterly or southwesterly wind. When the prevailing westerlies at the gradient level (approximately 1,500 m [5,000 ft] above ground) are strong, the winds channeled across the ESRP between the mountains become very strong. Some of the highest windspeeds at the INEEL have been observed under these meteorological conditions. The greatest frequency of high winds occurs in the spring (Clawson et al. 1989).

April is the month with the highest average monthly windspeed near surface (6 m [20 ft]) height, which for CFA is 15.3 km/h (9.3 mph). December is the month with the lowest average monthly windspeed (Clawson et al. 1989).

The INEEL is subject to severe weather. Thunderstorms with tornadoes are observed mostly during the spring and summer, but the tornado risk probability at the INEEL is about 7.8×10^{-5} per year (Bowman et al. 1984). An average of two to three thunderstorms a month occurs from June through August. Thunderstorms accompanied by strong gusty winds may produce local dust storms. Occasionally, a single thunderstorm will exceed the average monthly total precipitation (Bowman et al. 1984). Precipitation from thunderstorms at the INEEL is generally light.

Dust devils, common in the region, can entrain dust and pebbles and transport them over short distances. They usually occur on warm sunny days with little or no wind. The dust cloud may be several tens of meters (yards) in diameter and extend several hundreds of meters (hundred yards) into the air (Bowman et al. 1984).

The vertical temperature and humidity profiles in the atmosphere determine the atmospheric stability. Low levels of turbulence and less vertical mixing characterize stable atmospheres. This results in higher ground-level concentrations of emitted contaminants. The stability parameters at the INEEL range from stable to very unstable. Stable conditions occur mostly at night during strong radiant cooling. Unstable conditions occur during the day during periods of strong solar heating of the surface layer, or whenever a synoptic scale disturbance passes over the region (Bowman et al. 1984).

2.3 Geology

The geology of the INEEL is strongly influenced by volcanic and seismic processes that created the ESRP and the surrounding basin and range structures. The current evolution theory of the ESRP volcanic province is that the plain was formed in response to movement of the North American continent over a deep-seated plume of anomalously hot mantle rocks, the Yellowstone Plateau hotspot, that now resides beneath Yellowstone National Park (Armstrong et al. 1975). Movement of the continent and northeast-directed extension of the crust caused both the ESRP and the northeastern basin-and-range province to develop during the past 17 million years. During that time, extension of the crust has produced northwest-trending normal faults and mountain ranges, while volcanic activity associated with the Yellowstone hotspot has produced a belt of calderas along the ESRP. The Yellowstone hotspot was beneath the INEEL area approximately 6.5 to 4.3 million years ago and produced the Tertiary calderas and volcanic fields shown in Figure 2-3. These calderas and their associated explosive rhyolitic volcanism became extinct as the continent moved southwestward over the hotspot. The Pleistocene calderas of the Yellowstone Plateau formed from 2.1 to 0.6 million years ago, and strong geothermal activity continues as the hotspot still resides beneath the Yellowstone Plateau. Since volcanic activity began at the southwest end of the ESRP, the rate of movement of the plate over the deep-seated "hotspot" has averaged 1.4 cm/year (0.55 in./year) (Embree et al. 1982).

2.3.1 Regional Geology

The INEEL is located on the northern edge of the ESRP, an elongated northeast-trending volcanic province, 87 km (54 mi) wide, extending from the vicinity of Twin Falls, Idaho, on the southwest to Yellowstone National Park on the northeast. The ESRP lies within the northeastern part of the basin-and-range province of southern Idaho, and truncates basin and range structures on the northwest and southeast. The basin and range structures either terminate at the margin of the plain or extend only a few kilometers (miles) into the plain (Mabey 1982). Compared with the western SRP, the ESRP has not subsided greatly and is actually rising near its eastern tip (Leeman 1982).

The mountain ranges north of the ESRP are the Lemhi, Centennial, and Lost River (refer to Figure 2-1) ranges. These ranges are composed of Paleozoic sedimentary rocks that were folded and faulted along the northeastward-trending axis during late Cretaceous or early Tertiary laramide orogeny. Within the margins of the ESRP, Miocene and younger volcanic rocks rest on the deformed or tilted sedimentary and plutonic rocks ranging in age from Precambrian to Mesozoic and on faulted remnants of middle to late Eocene "calcalkalic" volcanic rocks (Leeman 1982).

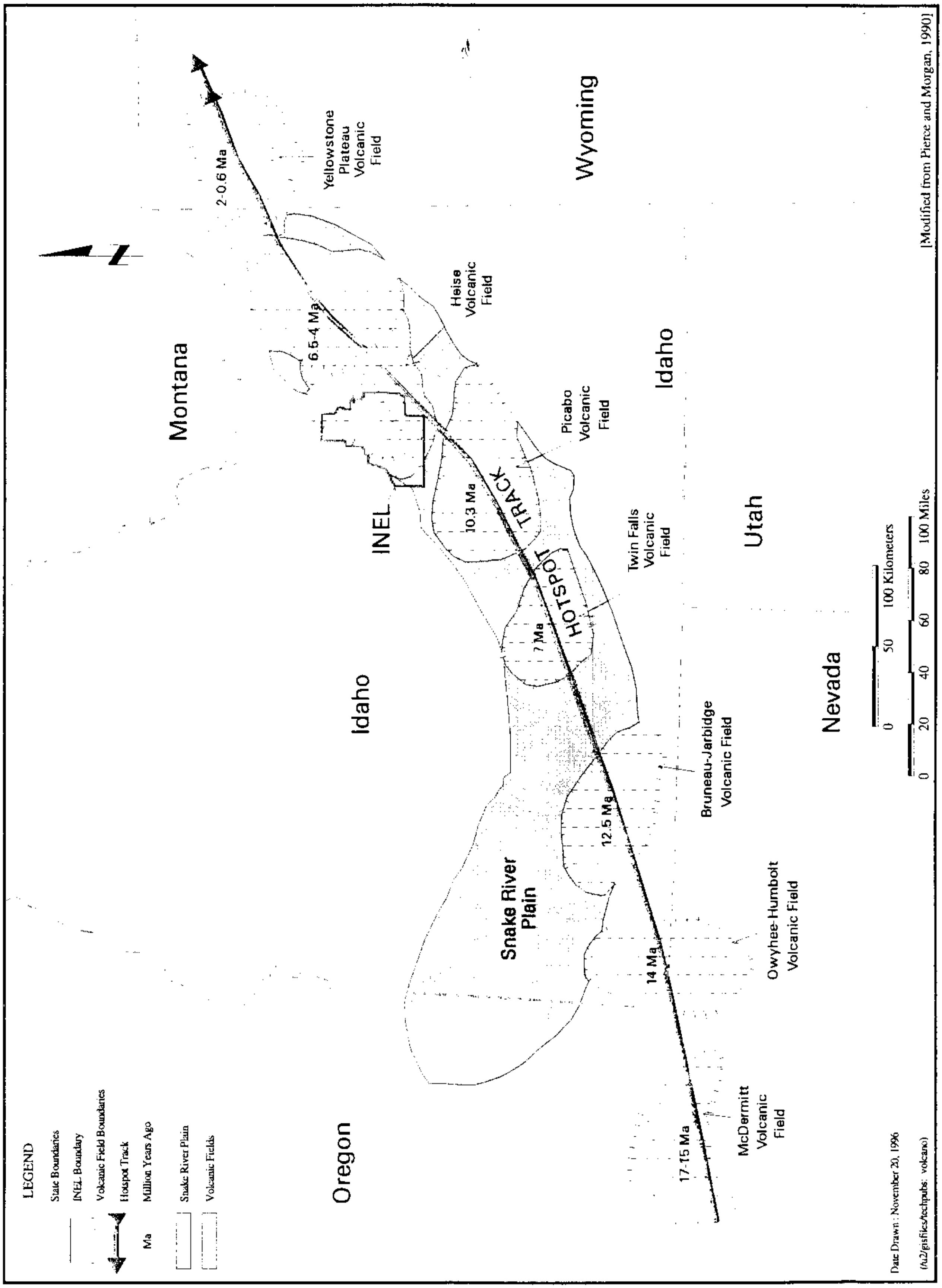


Figure 2-3. Yellowstone Plateau hotspot track and resulting volcanic fields.

During the past 4 million years, the ESRP, including the INEEL area, has experienced continued volcanic activity, mostly in the form of small outpourings of basaltic lava flows (Kuntz 1992). Vents for the basaltic volcanism are concentrated in northwest trending volcanic rift zones and along the axial volcanic zone (Figure 2-4). Sediments deposited from wind action, streams, and lakes also have accumulated in the ESRP, concurrent with the basaltic lava flows. Lithologic logs of four INEEL holes more than 610 m (2,000 ft) deep, including a 3,160 m (10,365 ft) deep geothermal test well (INEL-1) and hundreds of shallower drill holes (Figure 2-5), show that an interlayered sequence of basaltic lava flows and poorly consolidated sedimentary interbeds occur to depths of about 760 to 1,130 m (2,500 to 3,700 ft) beneath the INEEL. This sequence is underlain by a large sequence of unknown thickness of rhyolitic ash flow deposits related to the extinct Tertiary calderas.

Approximately 1.2 million years ago, rhyolite dome building was a minor style of volcanic activity along the axial volcanic zone (refer to Figure 2-4). Big Southern Butte (0.3 million years ago), East Butte (0.6 million years ago) (refer to Figure 2-3), and an unnamed dome between East Butte and Middle Butte (1.2 million years ago) are all rhyolite domes (Kuntz et al. 1990). In addition, a rhyolite dome occurs in the Cedar Butte volcanic system (0.4 million years ago) and probably beneath Middle Butte (of unknown age) (Kuntz et al. 1990).

Bedrock outcrops on and near the INEEL consist mostly of Quaternary basalt lava flows ranging in age from less than 15,000 to greater than 730,000 years (Kuntz et al. 1990). Paleozoic limestone and late Tertiary rhyolitic volcanic rocks at the south end of the Lost River Range (Arco hills) and the Lemhi Range occur in small areas along the northwest margin of the INEEL. Several Quaternary rhyolite domes occur along the axial volcanic zone near the southern and southeastern borders.

The sequence of basalt lava flows and sedimentary interbeds, 1,000 to 2,000 m (3,280 to 6,560 ft) thick, that characterize the ESRP (Malde 1991) make up the vadose zone and aquifer rocks beneath the INEEL. Time stratigraphic rock units in the basalt and sediment sequence range in age from approximately 4 million years at the base to 2,000 years along the Great Rift at the surface (refer to Figure 2-4). The basalt layers between sedimentary interbeds are typically made up of several different lava flows and flow groups that were emplaced over very short periods of geologic time (hundreds to thousands of years). The sedimentary interbeds, though typically thinner than the basalt layers, represent deposition during long periods (10^4 to 10^6 years) of volcanic quiescence (Kuntz 1992).

Because of the concentration of volcanic activity along the axial volcanic zone and along volcanic rift zones, these areas tend to be topographical highlands that receive less sediment than other areas. Thus, the total thickness of sediments in the basalt and sediment sequence tends to be greater near the plain margins (Whitehead 1986) and between volcanic rift zones. In fact, many of the drill holes along the axial volcanic zone show that no interbeds occur in that area. The combination of sparse interbeds, and the abundance of pahoehoe and pyroclastic material along the axial volcanic zone suggest the existence of a thicker and more active productive aquifer there than elsewhere on the ESRP as groundwater moves through the more permeable rock.

Sediments of diverse origins are interbedded with basalts of the ESRP. The sediments are composed of fine-grained silts that were deposited by wind action; silts, sand, and gravels deposited by streams such as the Big Lost River; and clays, silts, and sands deposited in the northern part of the INEEL, in lakes such as Mud Lake and its much larger Pleistocene predecessor, Lake Terreton. Because the sedimentary depositional processes operating in the geologic past are similar to those operating today, unconsolidated sediments that make up interbeds in the subsurface are similar to those that occur at the surface.

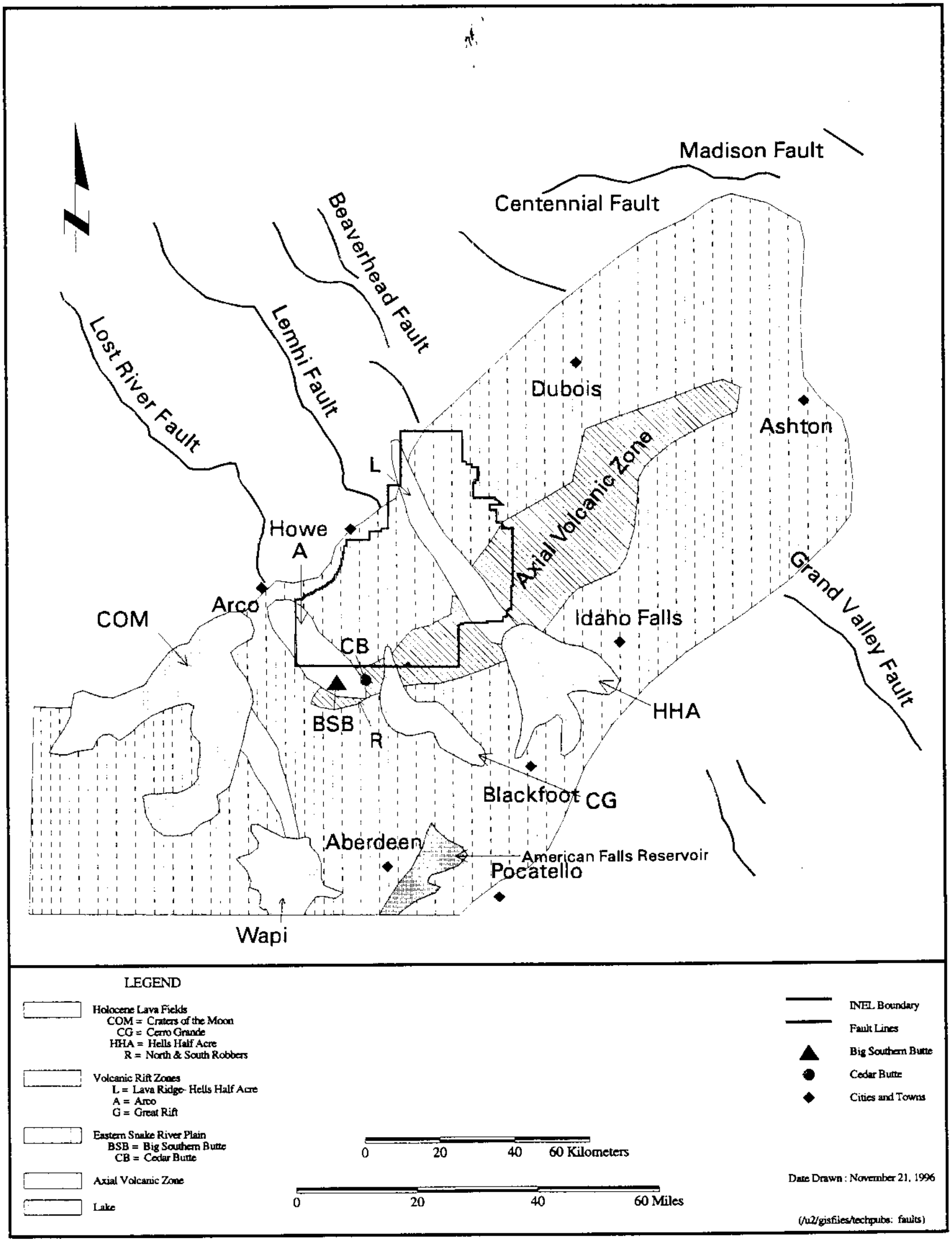


Figure 2-4. Illustration of the axial volcanic zone.

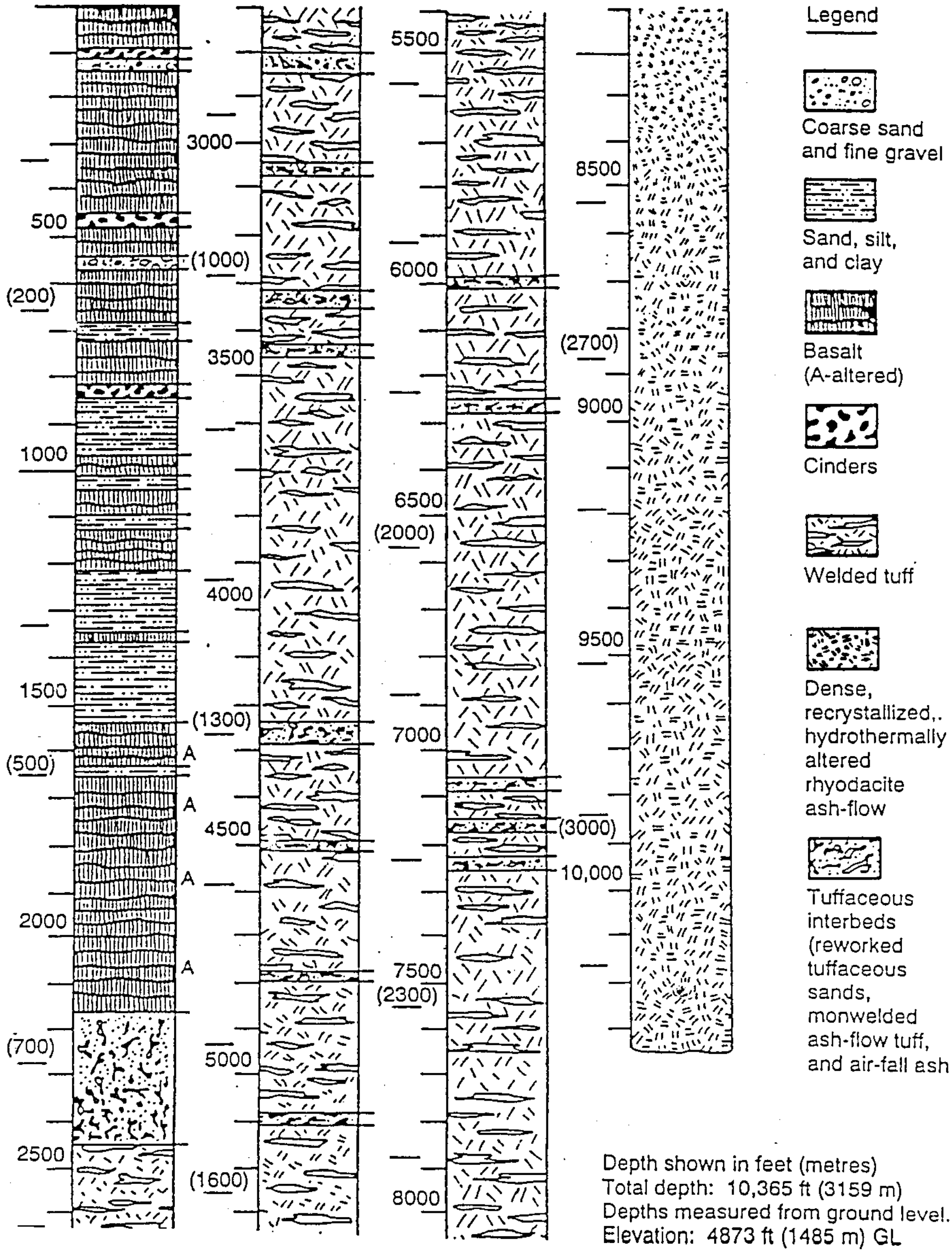


Figure 2-5. Log of drill hole INEL-1 (from Mann 1986).

Unconsolidated surficial deposits of various ages and origins cover much of the INEEL. A wide band of quaternary alluvium extends along the course of the Big Lost River from the southwestern corner of the INEEL to the Lost River sinks area in the north-central part of the INEEL. Lacustrine deposits of clays, silts, and sands deposited in Pleistocene Lake Terreton occur in the northern part of the INEEL.

Loess deposits (wind-deposited silts) cover much of the basalt to thicknesses of up to approximately 6 m (20 ft). Beach sands deposited at the high stand of Lake Terreton were reworked by winds in late Pleistocene and Holocene time and form large dune fields (eolian deposits) in the northeastern part of the INEEL (Scott 1982). Large alluvial fans occur in limited areas along the northwestern and western boundaries of the INEEL at the base of the Arco Hills and the Lemhi Range.

The mineralogical similarities in source-area rocks and sedimentary deposits at the INEEL were evaluated in a 1990 U.S. Geological Survey (USGS) report (Bartholomay 1990). While large amounts of feldspars and pyroxene in surficial sediment samples from the Big Lost River drainage reflect the large amount of volcanic rocks in the source area, higher amounts of calcite and dolomite in samples from the Little Lost River and Birch Creek drainages reflect the abundance of limestone and dolostone in the source areas. In conclusion, the mineralogy of sedimentary interbeds in the Radioactive Waste Management Complex (RWMC), TRA, and the Idaho Nuclear Technology and Engineering Center (INTEC) areas correlate with sediments of the Big Lost River drainage (Bartholomay 1990), and the mineralogy of sedimentary interbeds at Test Area North (TAN) correlates with surficial deposits of the Birch Creek drainage. These correlations suggest that the sedimentary interbeds probably were deposited in a depositional environment similar to present-day conditions.

2.3.2 Waste Area Group 6 Geology

Little site-specific geological information is available for the WAG 6 area. Production Well EBR-1 is the only well within the area reaching the SRPA. The well, with a total depth of 328 m (1,075 ft), is located south of Adams Boulevard between EBR-I and BORAX. The next-closest neighboring well, USGS 106, is approximately 2 km (1.25 mi) southeast of Well EBR-1.

More geological information is available for the regions around the RWMC and CFA. These facilities are close enough to the BORAX facility and EBR-I to extrapolate the general geologic character of the subsurface from those regions. The subsurface at WAG 6 is typical of the INEEL and general geological information applicable to the INEEL can be found in the following subsection, "WAG 10 Geology."

A thickness of approximately 4.6 m (15 ft) of silt overlies fractured basalt at Well EBR-1, based on the well's lithologic and geophysical logs. The lithologic log for Well USGS-106 shows a layer of silt less than 1.5 m (5 ft) thick. Surficial sediments have been characterized extensively at the RWMC, approximately 3.2 km (2 mi) to the southwest. There the sediments consist predominantly of silt, with discontinuous lenses of gravel and clay.

The stratigraphy of the basalt/sedimentary interbed sequence beneath the WAG 6 area is indicated by the lithology log for Well EBR-1 and is supported by geophysical logs run on the well. Sedimentary interbeds were recorded at approximate depths of 40 to 46 m (130 to 150 ft), 62 to 69 m (220 to 225 ft), 95 to 99 m (310 to 325 ft), 162 to 163 m (530 to 535 ft), 192 to 194 m (630 to 635 ft), and 265 to 297 m (870 to 975 ft). Clay is the lithology most commonly noted in the interbeds, but cinders, cinders and clay, and clay and basalt also appear on the lithologic log. Gravel and clay were encountered at the 95-m (310-ft) interbed, and sand was encountered at a depth of 192 to 194 m (630 to 635 ft).

The lithologic log for Well USGS-106 shows broad similarities to that of Well EBR-1. The upper 40 m (130 ft) of the sequence below the surficial sediments in USGS-106 consists of basalt uninterrupted by interbeds. The interval from a depth of 41 to 95 m (135 to 310 ft) includes several interbeds, similar to EBR-1, though the proportion of interbed to basalt appears higher in USGS-106. Only a few thin interbeds of clay or clayey silt interrupt the depth interval from 95 m (310 ft) to the bottom of the hole at 232 m (760 ft).

2.3.3 Waste Area Group 10 Geology

The surface of the INEEL is generally covered by Pleistocene and Holocene basalt flows (Figure 2-6). These basalts erupted mainly from northwest-trending volcanic rift zones, marked by belts of elongated shield volcanoes and small pyroclastic cones, fissure-fed lava flows, and noneruptive fissures or small-displacement faults (Bargelt et al. 1992). The second most prominent geologic feature of the INEEL is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast (Figure 2-6). The alluvial deposits grade into lacustrine deposits in the northern portion of the INEEL, where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks make up a small area of the INEEL along the northwest boundary. Three large silicic domes (East, Middle, and Big Southern buttes) occur along the southern boundary of the INEEL. A number of smaller basalt cinder cones occur across the INEEL. Mountains of the Lost River, Lemhi, and Bitterroot ranges that border the northwest portion of the INEEL are composed of Paleozoic limestones, dolomites, and shales created during the Cenozoic era by normal faulting. The fault-block ranges trend northwest-southeast, and the volcanic rifts that parallel the ranges are believed to be surface expressions of extensions of the range-front faults (Bargelt et al. 1992).

Basalt flows occurring at the surface and in the subsurface at the INEEL are thought to have been formed by plains-style volcanism, an intermediate style between flood basalt volcanism of the Columbia Plateau and basaltic shield of the Hawaiian Islands (Bargelt et al. 1992). Three general processes identified for the formation of basalt flows are (1) flows forming low-relief shield volcanoes, (2) fissure-fed flows, and (3) major tube-fed flows with other minor flow types (Bargelt et al. 1992). The very low shield volcanoes, with slopes of about one degree dip, form in an overlapping manner. This overlapping and coalescing of flows form the low relief surface of the ESRP (Bargelt et al. 1992). Flows at WAG 10 are characteristic of basalt on the ESRP and occur as layers of pahoehoe lava less than 1 m to a few meters (few feet to tens of feet) in thickness. Based on the work by Anderson and Lewis (1989), the average flow thickness for 22 flows is about 9 to 12 m (30 to 40 ft) and ranges from 3 to 36 m (10 to 120 ft). The basalt flows are interlayered with unconsolidated sediments, cinders, and breccia. Considerable variation in texture occurs within individual basalt flows. In general, the bases of basalt flows are glassy to fine-grained and minutely vesicular. The mid portions of the basalt flows are typically coarser-grained with fewer vesicles than the top or bottom of the flow. The upper portions of flows are fine-grained highly fractured with many vesicles. This pattern is the result of rapid cooling of the upper and lower surfaces, with slower cooling of the interior of the basalt flow. The massive interiors of basalt flows are sometimes jointed, with vertical joints in a hexagonal pattern formed during cooling (Wood et al. 1989).

The near-surface basalt flows in the southern portion of WAG 10 erupted from several volcanic vents in the southwestern portion of the INEEL. Most of the lava flows are younger than 500,000 years (Bargelt et al. 1992) and were erupted from vents in the Arco rift zone. Based on subsurface drilling investigations, it is believed that the topmost flow is about 100,000 years old and flowed nearly 24 km (15 mi) from its source vent at Quaking Aspen Butte to the southwest of WAG 10. The first two lava

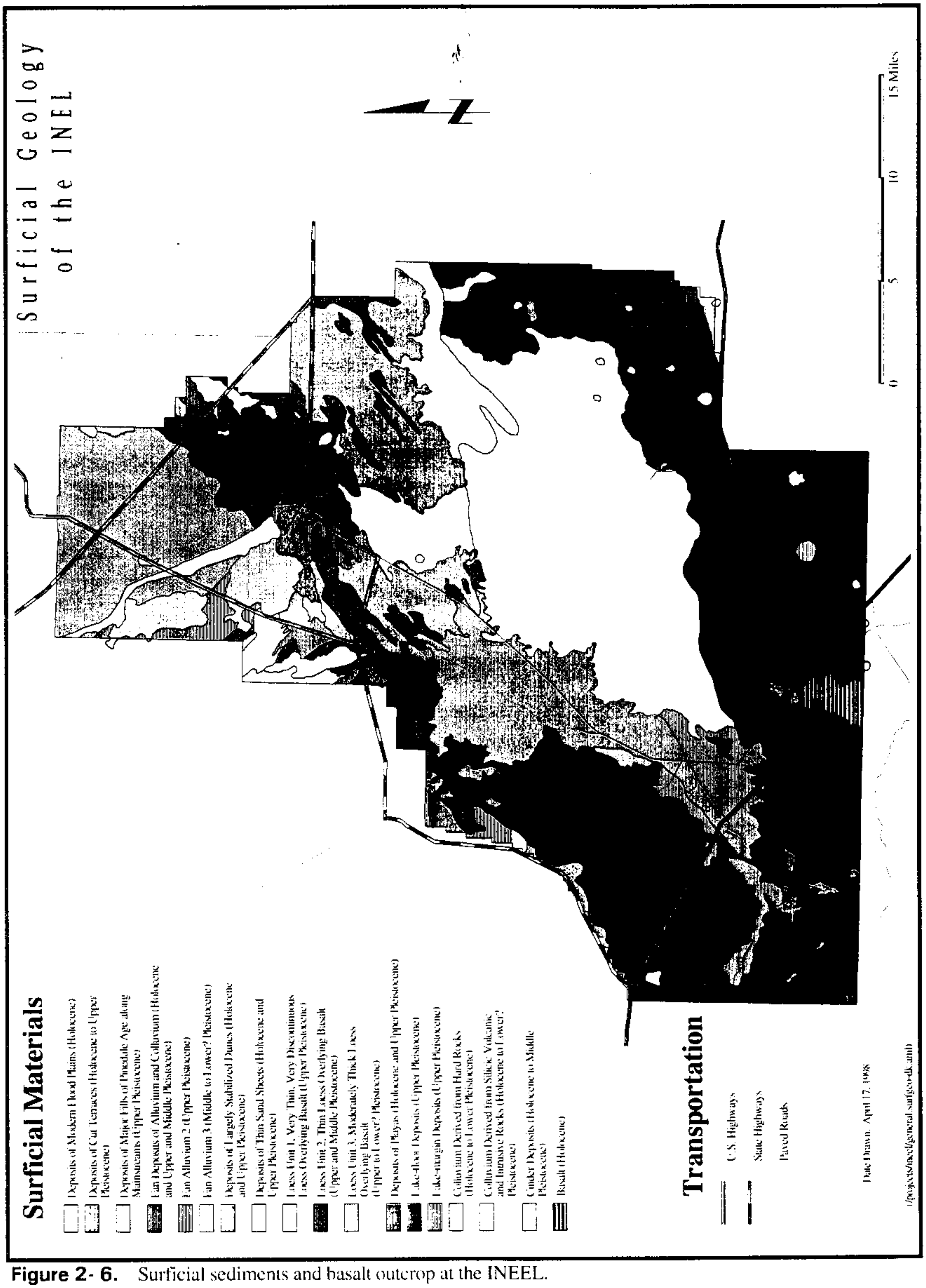


Figure 2- 6. Surficial sediments and basalt outcrop at the INEEL.

flows of another flow group near the surface of the Subsurface Disposal Area (SDA) are believed to have come from a butte just north of Big Southern Butte (Bargelt et al. 1992).

During quiescent periods between volcanic eruptions, sediments were deposited on the surface of the basalt flows. These sedimentary deposits display a wide range of grain-size distributions that depend on the mode of deposition (i.e., eolian, lacustrine, or fluvial), source rock, and length of transport. Because of the irregular topography of the basalt flows, sedimentary materials commonly accumulate in isolated depressions. Extensive sedimentary interbeds have been identified in the stratigraphy beneath the INEEL.

A number of wells have been drilled on the INEEL to monitor groundwater levels and water quality. Lithologic and geophysical logs have been made for almost all of the wells drilled on the INEEL. From these logs and an understanding of the volcanism of the SRP, it is possible to develop a reasonably comprehensive picture of subsurface geology. The INEEL is homogeneous in terms of mode of formation and types of geologic units encountered. The exact distribution of units at any specific site, however, is highly variable.

The seismic activity of eastern Idaho is concentrated along the Intermountain Seismic Belt, which extends more than 1,287 km (800 mi) from southern Arizona through eastern Idaho to western Montana. The Idaho seismic zone, one of two zones in this belt, extends from the Yellowstone Plateau area westward into central Idaho. Minor earthquakes have occurred on the ESRP, east and north of the INEEL, averaging about 1.0 local magnitude (EG&G 1988).

The largest earthquake recorded for the Idaho seismic zone occurred on October 28, 1983, measuring 7.3 on the Richter scale. This earthquake resulted from movement along a range-front fault. The epicenter was approximately halfway between Challis and Mackay, and the faulting broke the surface for 40 km (25 mi) along the western base of the Lost River Range. Though the earthquake was felt at the INEEL, no structural or safety-related damage occurred at any facility (EG&G 1988).

The INEEL soils are derived from Cenozoic felsic volcanic and Paleozoic sedimentary rocks from nearby mountains. The soils in the northern portion of INEEL are generally composed of fine-grained lake and eolian (wind-carried) deposits of unconsolidated clay, silt, and sand. Generally, the soils in the southern INEEL are shallow, consisting of fine-grained eolian soil deposits with some fluvial gravels and gravely sands (EG&G 1988).

2.3.3.1 Geology of the Liquid Corrosive Chemical Disposal Area. The Liquid Corrosive Chemical Disposal Area (LCCDA) sits at the boundary between a gentle, north-facing slope and the relatively flat alluvium along the drainage channel leading away from the RWMC. Drilling investigations conducted at the LCCDA in 1988 and 1993 indicate that the surface soils are light brown and composed mainly of sand and silt. Below a depth of approximately 0.61 m (2 ft), the soil changes to dark brown with slight moisture but is still made up of sand and silt. The depth to bedrock at the site ranges from 1.8 to 4.3 m (6 to 14 ft) and is generally 3.1 m (10 ft) deep in the vicinity of the disposal pits.

Underlying the surficial sediment is a sequence of interbedded basaltic lava flows and sedimentary interbeds several hundred meters (thousand feet) thick. Geologic logs of wells in the vicinity of the RWMC (Anderson and Lewis 1989) indicate an average thickness of 14 m (46 ft) of sedimentary interbeds above the water table, which occurs at a depth of about 177 m (580 ft) belowground. Physical properties of surficial sediments and sedimentary interbeds were measured at the RWMC, about 1.6 km (1 mi) west of the LCCDA, by the USGS (Barraclough et al. 1976). The sedimentary materials at the

RWMC are generally silty sand and are similar to those at the LCCDA. Therefore, physical properties of materials at the RWMC should provide a good estimate of physical properties of materials at the LCCDA. Seven samples of surficial sediments were collected in the 1976 study. The average bulk density of the materials was 1.82 g/cm^3, with an average porosity of 0.36 and an average volumetric moisture content of 0.18. Twenty-four samples of interbed material were collected. The average bulk density of the sedimentary interbed material was 1.95 g/cm^3, with an average porosity of 0.39 and an average volumetric moisture content of 0.27.

2.3.3.2 Geology of the Organic-Moderated Reactor Experiment Leach Pond. The OMRE leach pond, located near the STF, is approximately 4.0 km (2.5 miles) east of the CFA. The average elevation in the STF area is approximately 1,506 m (4,940 ft). The land surface is essentially flat and featureless and slopes gently to the northeast.

The thickness of surficial sediments ranges from 1 to 4 m (3 to 13 ft) in STF-area wells (Figure 2-7). The sediments are described as soil, hardpan, and clay, and are probably entirely eolian in origin (Sehlke and Bickford 1993).

As occurs throughout the INEEL, a sequence of basaltic lava flows and sedimentary interbeds underlays the OMRE. At the OMRE production well, near-surface interbeds are noted on the lithologic log at depth ranges of 21 to 23 m (70 to 75 ft) and 41 to 45 m (136 to 146 ft). The upper interbed consists of clay, and the lower one is described as sandy conglomerate (Sehlke and Bickford 1993).

The information on the subsurface geology of the STF area comes from the lithologic logs for five wells (Appendix I). The OMRE production well has a total depth of 287.3 m (942.6 ft). The EOCR production well, located approximately 180 m (600 ft) to the northwest, is 377 m (1,237 ft) deep. The information on the subsurface geology at the STF area comes from the lithologic logs from five wells. Two of the wells, the OMRE production well and EOCR production well, are completed to depths of 287.3 and 377 m (942 and 1,237 ft), respectively.

According to the lithologic log for the OMRE well, the depth interval between 45 and 194 m (146 and 636 ft) is uninterrupted by significant interbeds except for a clay layer at 129 to 130 m (422 to 427 ft). The relatively interbed-free interval is succeeded at greater depth by a zone in which interbed material makes up a high proportion of the total thickness of the sequence (60%). Most of the interval from 194 to 254 m (636 to 834 ft) is logged as red or gray clay, sandy clay, or shale (Sehlke and Bickford 1993).

The distribution of interbed material through the stratigraphic section is similar in the EOCR production well. Intervals of clay or clay-filled fractured lava are recorded at depths of 18 to 19 m (59 to 62 ft). As in the OMRE production well, the interval from the bottom of the second interbed down to a depth of more than 183 m (600 ft) is logged as relatively free of interbeds. Interbed material makes up more than half of the thickness of the interval from 199 to 304 m (652 to 996 ft) belowground. Interbeds consist predominantly of clay and sandy clay, sometimes mixed with cinders. Gravel was noted in the interval from 258 to 279 m (845 to 916 ft) (Sehlke and Bickford 1993).

2.4 INEEL Soils

Four basic soilscapes exist at the INEEL: (1) wind-blown sediments over lava flows (eolian), (2) river-transported sediments deposited on alluvial plains, (3) fine-grained eroded sediments eroded into lake or playa basins (lacustrine), and (4) colluvial sediments originating from bordering mountains.

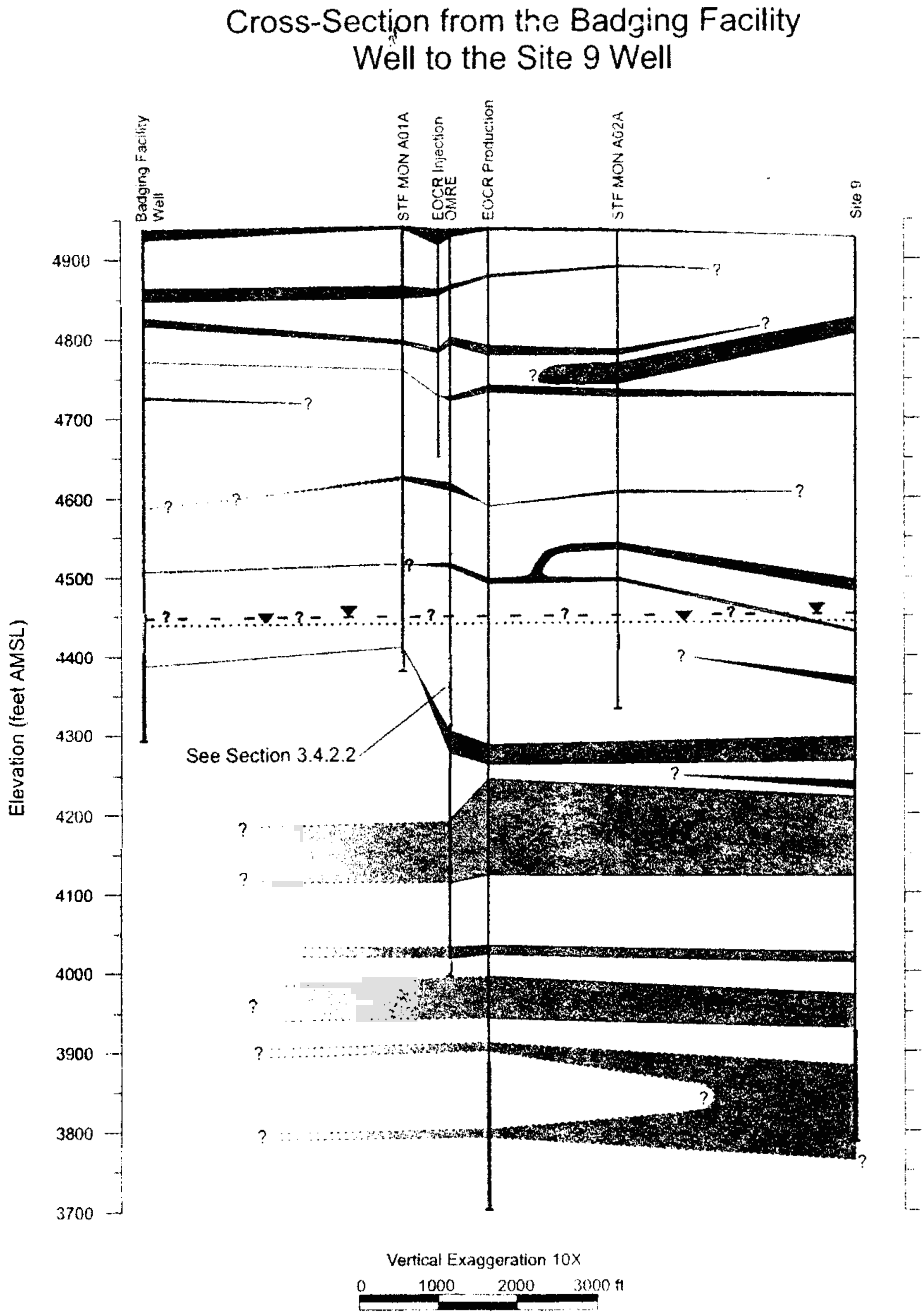


Figure 2-7. Geologic cross section of the OMRE area.

Legend

Basalt

Undifferentiated Sedimentary Interbeds

Lithologic Contact (Querried and/or Dashed Where Inferred)

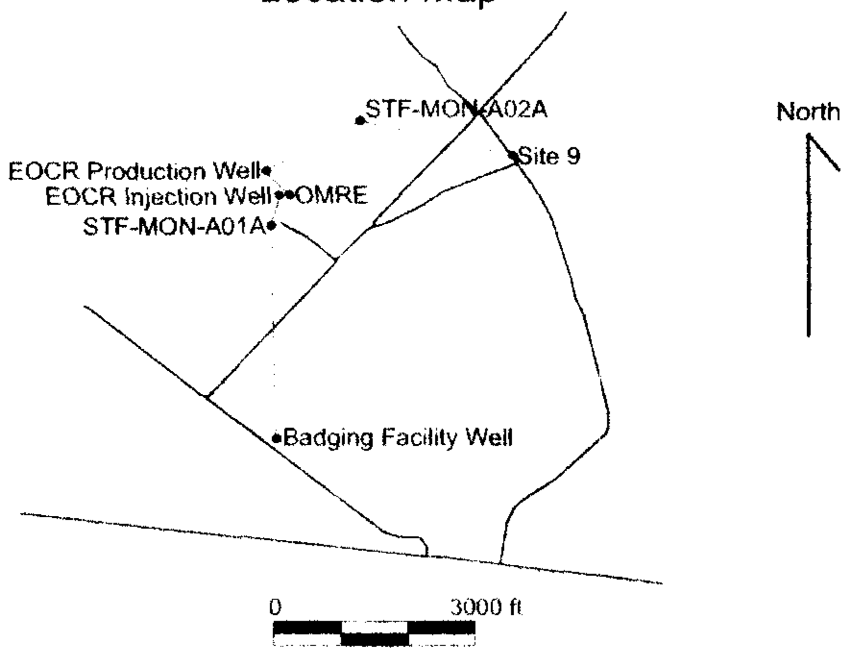
Inferred Water Level In Wells Completed Above Thick Sedimentary Interval Indicated as "α".

Inferred Water Level In Wells Completed Below Thick Sedimentary Interval Indicated as "α".

Perforated or Casing Well Screen

Open Hole Well Completion

Location Map



Notes

Cross-Section compiled from lithologic and geophysical logs using methods described in Anderson (1991). Water level information from Neher (August, 1996). Prepared by R. Podgorney, 1/98.

Figure 2-7. (continued).

A soil map of the INEEL (Figure 2-8) depicts the distribution of the various landscapes. The alluvial deposits follow the courses of the modern Big Lost River and Birch Creek. The playa soils are located in the north-central part of the INEEL Site. The colluvial sediments are located along the western edge of the Site. Silt- and sand-covered lava plains occupy the rest of the INEEL landscape.

2.4.1 Wind-Blown Sediments over Lava Flows

Wind-blown sediments over lava flows are a common soilscape at the INEEL. The soils formed in these sediments range in texture from the fine-grained wind-blown glacial flour (loess) left behind by retreating glaciers during the pleistocene epoch to eolian sand believed to have originated from the Big Lost and Snake rivers and from the shorelines of the ancient Lake Terreton. Dating of the loess with thermoluminescence and radiocarbon methods indicates that at least two distinct episodes of loess accumulation were represented on the INEEL. The youngest loess was deposited between 10,000 and 40,000 years ago, and the older loess was deposited about 60,000 to 80,000 years ago. Soils developed in the two deposits are markedly distinct. Subsoil in the younger soil contains high amounts of carbonates that have accumulated over the years of low rainfall and high evaporation. In contrast, the older soil (paleosol) was developed when effective precipitation was higher. Consequently, salts have been leached out of the subsoil, and fine particles (clays) have been deposited from the surface to the subsoil. Subsoil horizons of the older soil have relatively high amounts of clay rather than carbonates.

The Natural Resources and Conservation Service identifies wildlife habitat and rangeland as the primary uses for these loess-over-lava soils. Development of these areas is possible, as demonstrated by the Power Burst Facility (PBF), Auxiliary Reactor Area (ARA), and ANL-W complexes, but is complicated by the necessity to blast through the lava to establish footings.

2.4.2 Alluvial Deposits

Deposits transported by rivers can be found in the flat expanses of the Big Lost River, Little Lost River, and Birch Creek alluvial plains. River action has truncated the former undulating lava landscape, leaving behind a layer of rounded river rock beneath a blanket of silty and sandy sediments.

The Big Lost River drains about 3,626 km^2 (1,400 mi^2). It enters the INEEL Site on the southwest end, flows east, then flows northward, and terminates in the Big Lost River sinks. Three recognized terraces of the Big Lost River are located on the INEEL. Around the TRA, older deposits are capped with desert pavement and present accumulated salts in the subsurface at a depth of about 25.4 to 30.5 cm (10 to 12 in.). Typically, the soils are gravely sands to gravely loams or loamy sands, with low water-holding capacity and high permeability. Younger deposits generally do not exhibit a well-developed carbonate-enriched subsurface horizon, and most are not capped with desert pavement.

Birch Creek originates from springs below Gilmore Summit in the Beaverhead Mountains and terminates on the INEEL in an area called the Birch Creek playa. The Birch Creek alluvial deposits on the INEEL are generally gravely loams. The playa deposit, in contrast, is described in the USDA soil classification as a deep, calcareous, alkaline, silty clay loam, or silty clay.

Alluvial plains are among the most valued landscapes because they provide flat terrain, subsurface gravels that are relatively easy to excavate, increased moisture and associated higher soil productivity, and desirable animal habitat. Most of the facilities at the INEEL have been located within alluvial plains. Gravel pits on the north end of the INEEL Site are located within the cobbles and gravels deposited by Birch Creek.

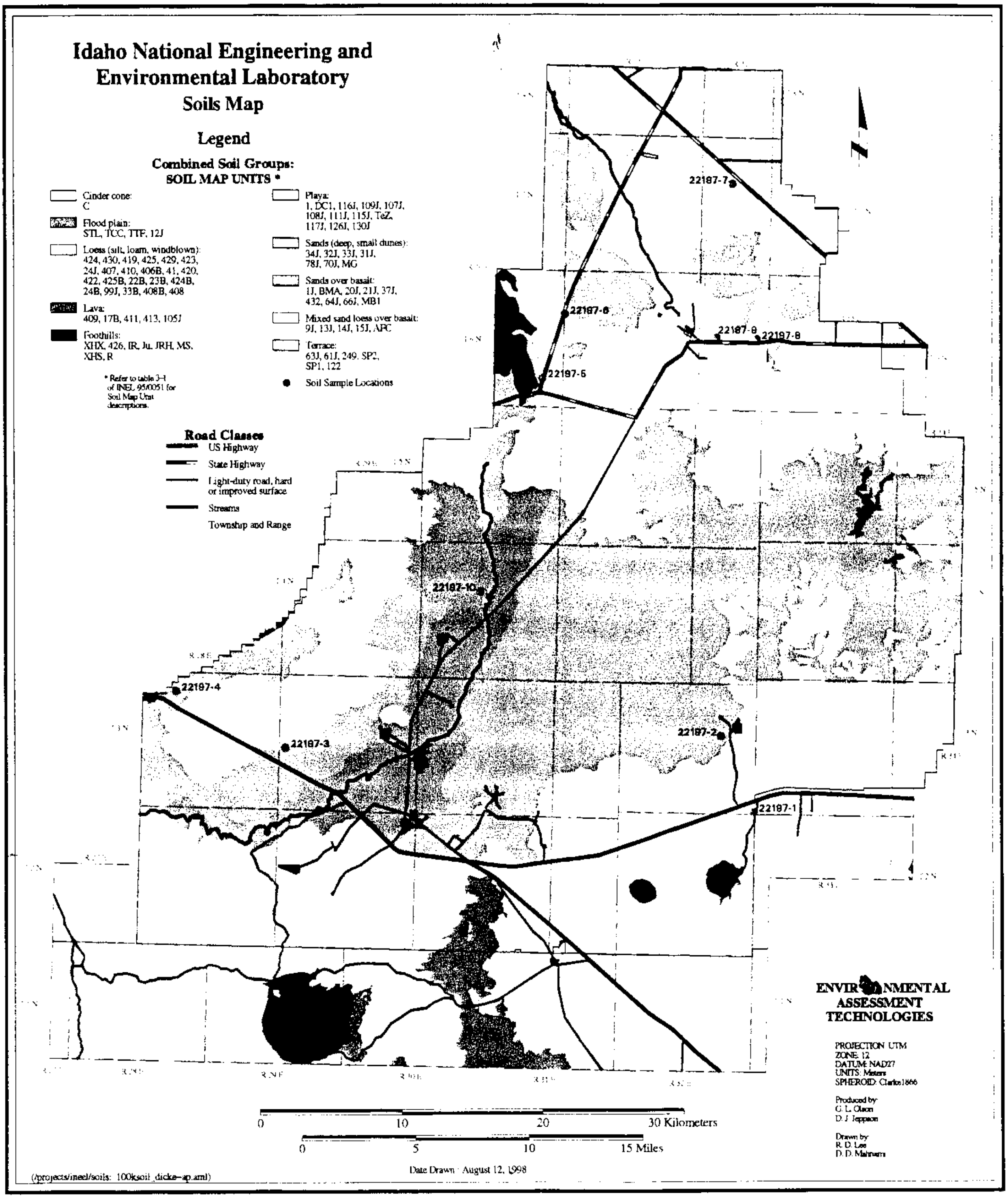


Figure 2-8. INEEL Soil Map.

Near the CFA, several gravel pits are located within the deposits of the Big Lost River. Some of the pits are located at a considerable distance from the modern channel and mark the extent of the river during the glacial pleistocene epoch.

2.4.3 Lacustrine Deposits, Playas, and Sand Dunes

Another major landscape feature at the INEEL is the playa or desert lake basin. The modern-day playas at the INEEL are the Birch Creek playa and the Big Lost River sinks. These basins, located at the terminuses of the Big Lost River and Birch Creek, contain a thick layer of fine-grained sediments. The ancestral Lake Terreton occupies much of the northern part of the INEEL and is overlain in many areas by sand dunes or elongated sand "trains." The ancestral lake was once a shallow (8 m [26 ft]) lake that covered about 150 km^2 (58 mi^2) and filled its basin as recently as 700 years ago. The lake was probably originally fed by both the Big Lost River and Birch Creek, and the high stage of the lake is estimated to be at an altitude of about 1,463 m (4,800 ft) above mean sea level. The lacustrine deposits generally consist of clayey, alkaline surface soils over stratified subsoils. Some of the "slick spot" soils in the ancestral lakebed contain high amounts of exchangeable sodium and are characterized by a lack of vegetation and cracked surfaces.

Bars, spits, and hooks from the ancestral Lake Terreton are well preserved on the modern landscape near TAN. The deposits near TAN are generally quite saline and support a variety of salt-tolerant plant species.

Patches of sand throughout the ancestral lake area overlay the clayey lake deposits and are believed to have originated from the beaches of the Lake Terreton or the Big Lost or Snake rivers. The sands on the northeast end of the INEEL Site are deposited in elongated dunes, which are likely still shifting like the St. Anthony Sand Dunes, which may have similar origins. The sandy deposits typically support big sagebrush and Indian ricegrass, thus offering comparably tall, unique habitats.

Another set of significant playas on the INEEL is the spreading areas located on the southern end of the site. The spreading areas also contain silty and clayey sediments of various depths.

Playas in general are attractive for development because of the deep silty deposits; however, the soils may be subject to flooding and cracking. The shrink-swell capacity of the soils in areas under consideration for development should be checked, and the flooding potential of the surrounding basin should be evaluated. Soil cracking can lead to ruptured roadways and foundations. Soil salinity may preclude agricultural development in the playas and may limit the potential of the land for grazing. Soils from the playas may be easily excavated for fill materials, but again care must be taken to determine the shrink-swell capacity. Sediments with the ability to crack may be unsuitable as low-permeability clay liners or covers.

2.4.4 Colluvial Deposits

Colluvial deposits are prevalent along the base of the mountainous slopes on the west side of the INEEL and surrounding the East and Middle buttes. Generally, the soils in these deposits are gravely. Very little information is available about the soils within these deposits.

Soils developed within the colluvial deposits are subject to erosion, have comparably short growing seasons, and are generally suitable for rangeland and wildlife.

2.5 Hydrology

This section provides an overview of the hydrology at the INEEL and a discussion of the hydrology in the vicinity of the OU 10-04 sites to be characterized. It summarizes previous work performed by both the USGS and site contractors. A comprehensive and more detailed summary of the INEEL and surrounding area hydrology can be found in Appendix K.

2.5.1 Surface Water Hydrology

Surface water hydrology at the INEEL includes water from three streams that flow onto the INEEL in wet years and from local runoff caused by precipitation and snowmelt. Most of the INEEL is located in the Pioneer Basin into which the Big Lost River, the Little Lost River, and Birch Creek drain. These streams receive water from mountain watersheds located to the north and northwest of the INEEL. The average annual discharge, upstream of the INEEL, for the Big Lost River (below the Mackay Dam), the Little Lost River, and Birch Creek is 8.9 m^3/sec (314 ft^3/sec), 2 m^3/sec (70 ft^3/sec), and 2.2 m^3/sec (78 ft^3/sec), respectively (DOE 1991). Stream flows often are depleted before reaching the INEEL by irrigation diversions and infiltration losses along stream channels. The Pioneer Basin has no outlet; therefore, water flowing onto the INEEL either evaporates or infiltrates into the ground (Irving 1993).

The Big Lost River is the major surface water feature on the INEEL. Its waters are impounded and regulated by Mackay Dam, which is located approximately 6 km (4 mi) north of Mackay, Idaho. Upon leaving the dam, waters of the Big Lost River flow southeastwardly past Arco and onto the ESRP. Flow in the Big Lost River that actually reaches the INEEL is either diverted at the INEEL diversion dam and spread to areas southwest of the RWMC, or continues northward across the INEEL in a shallow channel to its terminus at the Lost River sinks. Flow in the sinks is lost to evaporation and infiltration (Irving 1993).

The Little Lost River drains from the slopes of the Lemhi and Lost River ranges. Flow in the Little Lost River is diverted for irrigation north of Howe, Idaho, and does not normally reach the INEEL. Springs below Gilmore Summit in the Beaverhead Mountains and drainage from the surrounding basin are the source for Birch Creek. Flowing in a southeasterly direction between the Lemhi and Bitterroot ranges, the water of Birch Creek is diverted north of the INEEL for irrigation and hydropower during the summer months. During the winter months, when water is not used for irrigation, water is returned to an anthropogenic channel on the INEEL at the north end of the Site in which the water infiltrates into channel gravels, recharging the aquifer (Irving 1993).

2.5.2 Groundwater Hydrology

The SRPA consists of a series of saturated basalt flows and interlayered pyroclastic and sedimentary materials that underlie the SRP. The SRPA, approximately 322 km (200 mi) long and 65 to 95 km (40 to 60 mi) wide, covers an area of approximately 25,000 km^2 (9,600 mi^2). It extends from Hagerman, Idaho, on the west to near Ashton, Idaho, northeast of the INEEL. The Environmental Protection Agency (EPA) designated the SRPA a sole source aquifer under 56 FR 50634, "Safe Drinking Water Act" on October 7, 1991.

The permeability of the aquifer is controlled by the distribution of highly fractured basalt flow tops and interflow zones with some additional permeability contributed by vesicles and intergranular pore spaces. The variety and degree of interconnected water-bearing zones complicate the direction of groundwater movement locally throughout the aquifer (Barraclough et al. 1981). Although a single lava flow may not be a good aquifer, a series of flows may include several excellent water-bearing zones. If the sequence of lava flows beneath the SRP is considered to constitute a single aquifer, it is one of the world's most productive (Mundorff et al. 1964).

A 1974 report on the effects of liquid waste disposal on the geochemistry of water at the INEEL (Robertson, Schoen, and Barraclough 1974) estimated that as much as 2.5×10^{12} m^3 (2 billion acre-ft) of water may be stored in the aquifer, approximately 6.2×10^{11} m^3 (500 million acre-ft) of which are recoverable. Later estimates suggest that the aquifer contains approximately 4.9×10^{11} m^3 (400 million acre-ft) of water in storage. The aquifer discharges approximately 8.8×10^{9} m^3 (7.1 million acre-ft) of water annually to springs and rivers. Pumpage from the aquifer for irrigation totals approximately $2.0 \times 10^{9} m^3$ (1.6 million acre-ft) annually (Hackett et al. 1986).

Recharge to the SRPA from within INEEL boundaries is primarily in the form of infiltration from the rivers and streams draining the areas to the north, northwest, and northeast of the SRP. In most years, spring snowmelt produces surface runoff that accumulates in depressions in the basalt or in playa lakes. On the INEEL, water not lost to evapotranspiration recharges the aquifer because the INEEL is in a closed topographic depression. Significant recharge from high runoff in the Big Lost River causes a regional rise in the water table over much of the INEEL. Water levels in some wells have been documented to rise as much as 1.8 m (6 ft) following very high flows in the Big Lost River (Pittman, Jensen, and Fischer 1988).

Water table contours for the SRPA below the INEEL are depicted in Figure 2-9. The regional flow is to the south-southwest, though locally the direction of groundwater flow is affected by recharge from rivers, surface water spreading areas, pumpage, and heterogeneities in the aquifer. Across the southern INEEL, the average gradient of the water table is approximately 0.95 m/km (5 ft/mi) (Lewis and Goldstein 1982). Depth to water varies from approximately 60 m (200 ft) in the northeast corner of the INEEL to 305 m (1,000 ft) in the southeast corner.

The USGS estimated (Mann 1986) the thickness of the active portion of the SRPA at the INEEL to be between 75 and 250 m (250 and 820 ft). Drilling information from the deep geothermal test well (INEL-1) located 4 km (2.5 mi) north of the TRA suggests an active flow system thickness of between 134 and 250 m (440 and 820 ft) (Mann 1986).

Studies of drill cores from several of the deep exploration drill holes on the INEEL (most notably CH2-2A and WO-2) show that secondary mineralization and alteration significantly reduce the porosity and permeability of basalts at depths of 370 to 550 m (1,200 to 1,800 ft). Geophysical logs also show that water movement and water content drop off rapidly at this depth interval. Together, logs and cores suggest that the bottom of the active portion of the aquifer lies in the 370 to 550 m (1,200 to 1,800 ft) depth range.

2.5.3 Natural Water Chemistry

The natural groundwater chemistry of the SRPA beneath the INEEL is determined by (a) the chemical composition of groundwater originating outside of the INEEL, (b) the chemical composition of precipitation falling directly on the land surface, (c) the chemical composition of streams, rivers, and runoff infiltrating into the aquifer, and (d) the weathering reactions that occur as water interacts with the minerals composing the aquifer (Wood and Low 1986, 1988).

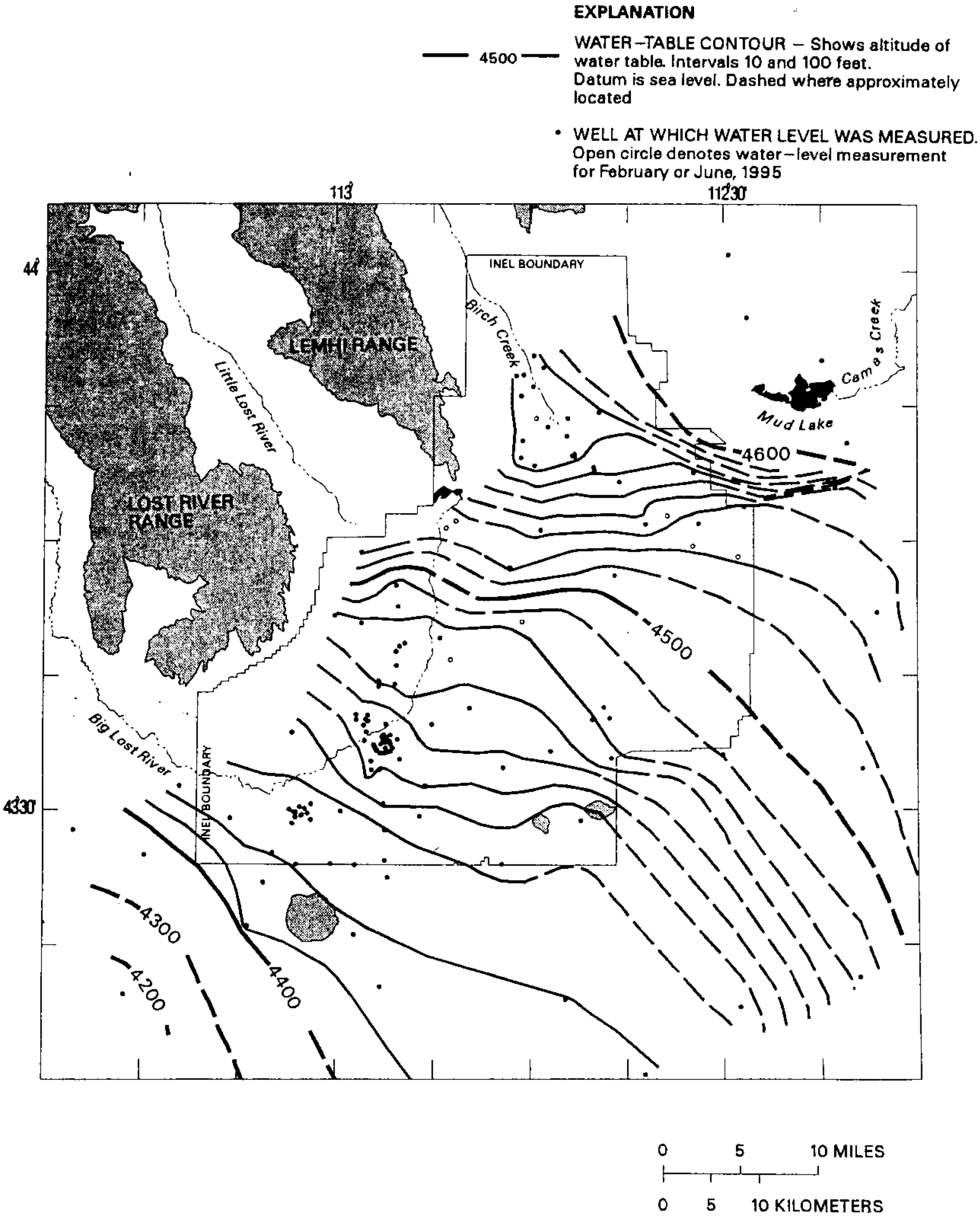


Figure 2-9. Altitude of the water table for the Snake River Plain aquifer in the vicinity of the INEEL, March—May 1995.

Figure 2-10 shows the hydrogeochemical zones of groundwater beneath the INEEL. Groundwater entering the INEEL from the northwest contains calcium, magnesium, and bicarbonate because this water has been in contact with sedimentary rocks containing these compounds. Groundwater entering the INEEL from the east contains sodium, fluorine, and silicate because it has been in contact with volcanic rocks containing these compounds (Robertson et al. 1974).

The influence of direct precipitation on the SRPA is small because total precipitation on the SRP is generally low, and evaporation rates in this region are high. The concentration of dissolved compounds, such as calcium and sodium, in precipitation is generally much lower than that of rivers and streams where the water has had greater contact with soluble minerals (Wood and Low 1988).

The Big Lost River, Little Lost River, and Birch Creek infiltrate into the northern and western portions of the INEEL. Infiltration of these surface waters into the SRPA tends to increase calcium and magnesium concentrations while diluting silicate and sodium concentrations (Robertson et al. 1974).

Calculations suggest that about 20% of all dissolved compounds leaving the SRPA result from weathering reactions within the aquifer. These weathering reactions include dissolution of minerals, such as olivine and anhydrite, as well as precipitation of calcite and silica (Wood and Low 1986, 1988). The remaining 80% of dissolved compounds present in water leaving the SRPA originate from the three sources previously described: (1) groundwater originating from outside the SRP, (2) infiltration of surface water, and (3) precipitation on the land surface. Groundwater originating outside the SRP and infiltration of surface water are the primary sources.

Recent and on going research on naturally occurring isotope concentration in groundwater suggests that preferential flow paths exist within the aquifer at the scale of the INEEL. A data set of 36 Sr isotope ratio measurements collected by DOE researchers, combined with previous measurements made by the USGS workers, provides critical information about patterns of groundwater flow in the aquifer beneath the INEEL and surrounding region. Previously studied mixing of distinct groundwater masses causes a SE/NW oriented gradient in the Sr isotope ratio (87/86) of the southwesterly flowing groundwater. Johnson et al., 1997 postulate that reaction effects between the aquifer host rock and groundwater also contribute to the observed geochemical patterns (Figure 2-11). High-87/86 waters entering the system from the north apparently react with low 87/86 glassy basalts or interbed sediments of the aquifer and evolve toward lower 87/86 ratio water. The groundwater isotopic evolution is non-uniform spatially and suggests strong spatial contrasts in flow velocity. In one N-S trending zone, the 87/86 gradient along the regional flow direction is small, suggesting that flow is rapid and contact time with the rock is small relative to neighboring zones with stronger 87/86 gradients. This pattern is also observed in U isotope data (Roback et al. 1997). The striking patterns in the isotopic data are generally not reflected in dissolved concentrations of 14 elements typically measured during analysis of groundwater. This difference between isotope ratios and concentrations is expected because concentrations change according to the net effect of simultaneous dissolution and precipitation, while isotope ratios are influenced by fewer reactions. Sr and U isotope ratios are not affected by precipitation reactions and Sr isotope ratios are better indicators of dissolution and/or exchange reactions and are more easily interpreted as indicators of preferential flow zones.

Roback et al. 1997 used the short- and long-lived members of the U- and Th-decay series to model contaminant transport at the INEEL. The isotopic composition and concentration of uranium in 28 groundwater samples helped to delineate mixing trends and flow-paths. Groundwater nearest Birch Creek and Little Lost River has high U-234/U-238 ratios, in contrast to the low to moderate values of

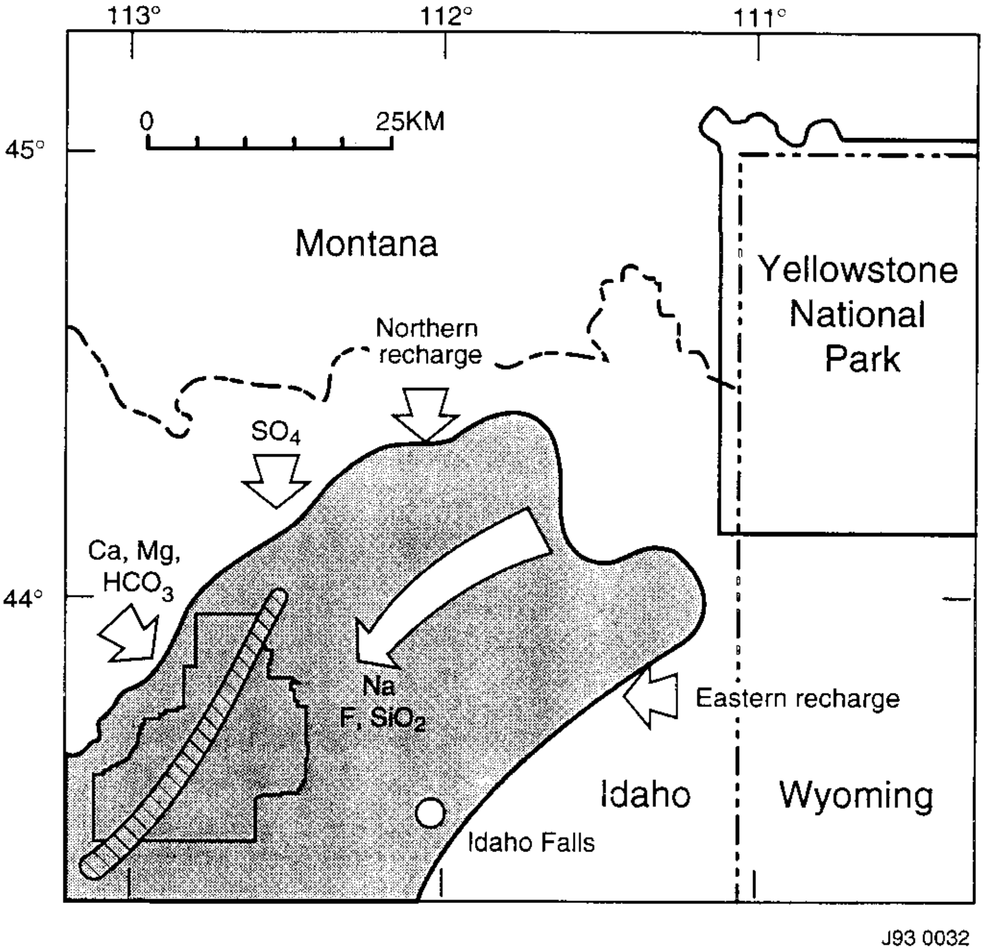


Figure 2-10. Hydrogeochemical zones of ground water and sources of chemically distinct recharge to the ESRP (shaded area). Zone of mixing between Ca-Mg-HCO_3 water and water enriched in Na-F-SiO_2 is indicated by diagonal ruling.

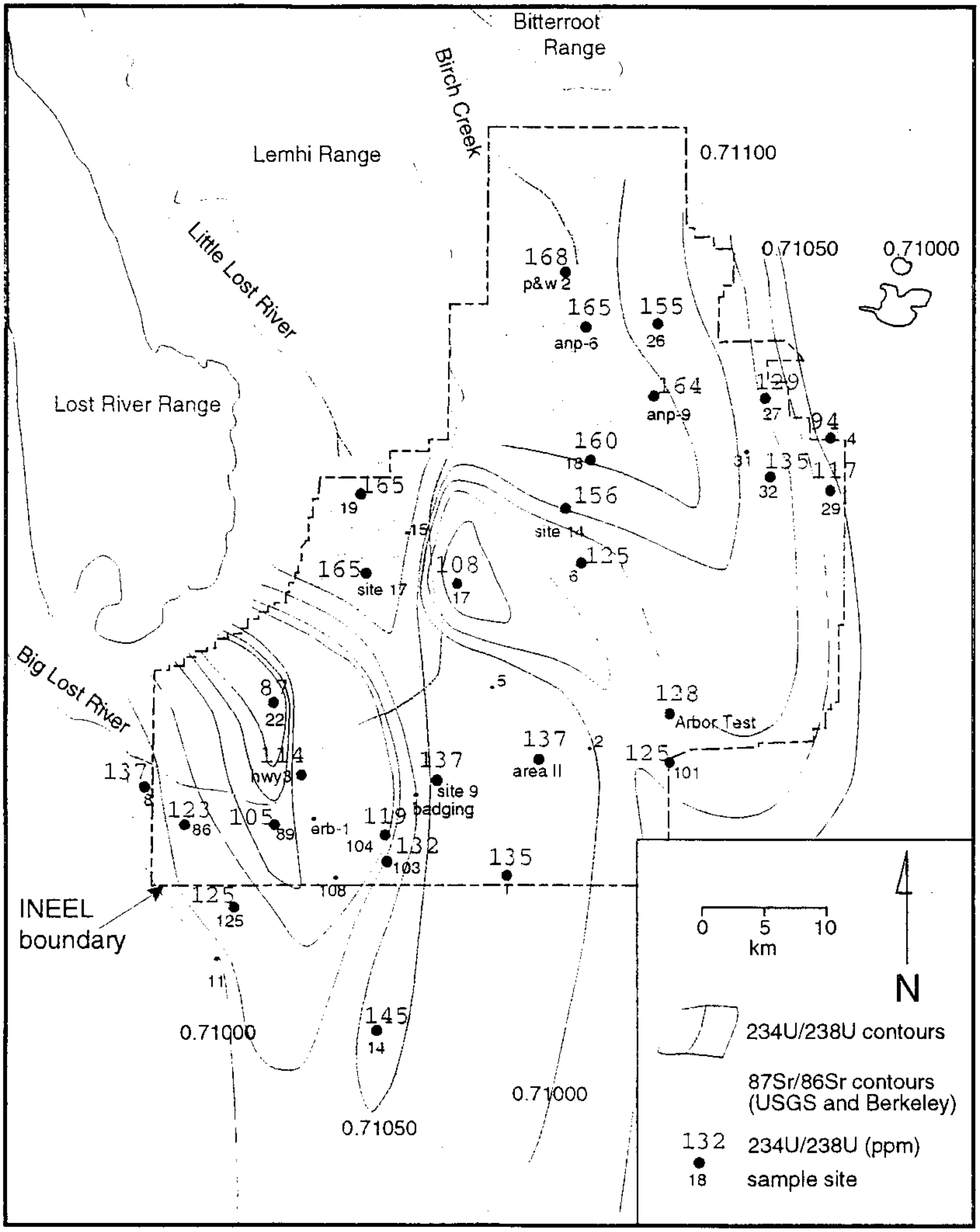


Figure 2-11. Uranium and Strontium isotope ratio map of the INEEL and vicinity.

groundwater dominated by the regional southwesterly flow of the Snake River Plain Aquifer. Mixing of these water masses can account for the intermediate uranium values of many of the samples. Contours of high U-234/U-238 ratios delineate preferential flow-paths extending southward from the Birch Creek and Little Lost River recharge areas.

U-234/U-238 ratios generally decrease in the direction of groundwater flow, a feature that is probably due to interaction between groundwater and the host basalt. It appears that dissolution and/or ion exchange have dominated over alpha recoil or selective leaching processes in this region and have resulted in lowering the U-234/U-238 ratios towards equilibrium values. Samples with the lowest uranium in concentrations occur in two isolated pockets (refer to Figure 2-11). These are interpreted to represent groundwater with longer residence time in the aquifer that has reacted to a greater extent with the host rock.

2.6 Ecology

The INEEL is located in a cool desert ecosystem characterized by shrub-steppe vegetation typical of the northern Great Basin and Columbia Plateau regions. The surface of the INEEL is relatively flat, with several prominent volcanic buttes and numerous basalt flows that provide important habitat for small and large mammals, reptiles, and some raptors. The INEEL site serves as a refuge from significant disturbance and development of wildlife habitat (DOE-ID 1997). The "core" of the site constitutes the largest area of undeveloped and ungrazed sagebrush steppe outside of national parklands in the intermountain west (DOE-ID 1997). The shrub-steppe communities provide habitat for sagebrush (*Artemisia* spp.) community species. Other communities are dominated by rabbitbrush (*Chrysothamnus* spp.), grasses and forbs, salt desert shrubs (*Atriplex* spp.), and exotic weed species. Juniper woodlands occur near the buttes and in the northwest portion of the INEEL. These woodlands provide important habitat for raptors and large mammals. Limited riparian communities exist along intermittently flowing waters of the Big Lost River and Birch Creek drainages.

Vegetation communities of the INEEL have been characterized and mapped using LANDSAT imagery data (Kramber et al. 1992). Sagebrush communities occupy most of the INEEL, but communities dominated by salt bush, juniper, crested wheatgrass, and Indian ricegrass are also present and distributed throughout the INEEL. Exotic plant species including cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratus*), and Russian thistle (*Salsola kali*) are established, particularly in disturbed areas. Crested wheatgrass (*Agropyron cristatum*), a European bunchgrass seeded in the late 1950s, dominates disturbed areas where it was used to provide cover and to hold soils.

The sagebrush communities consist of a shrub overstory with an understory of perennial grasses and forbs. The most common shrub is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) may dominate or be codominant with Wyoming big sagebrush on sites having deep soils or sand accumulations (Shumar and Anderson 1986). Big sagebrush communities occupy most of the central portions of the INEEL. Green rabbitbrush (*Chrysothamnus viscidiflorus*) is the next most abundant shrub. Other common shrubs include winterfat (*Krascheninnikovia lanata*), spiny hopsage (*Grayia spinosa*), and gray rabbitbrush (*Chrysothamnus nauseosus*). Communities dominated by Utah juniper (*Juniperus osteosperma*) and three-tipped sagebrush (*Artemisia tripartita*) or black sagebrush (*Artemisia nova*), or both, are found along the periphery of the INEEL on slopes of the buttes on-Site and foothills of adjacent mountain ranges to the northwest.

The understory of grasses and forbs includes the rhizomatous thick-spiked wheatgrass (*Elymus lanceolatus*) as the most abundant grass. Bottlebrush squirreltail (*Elymus elymoides*), Indian ricegrass (*Oryzopsis hymenoides*), and needle-and-thread (*Stipa comata*) are common bunchgrasses. Patches of creeping wildrye (*Leymus triticoides*) and western wheatgrass (*Pascopyrum smithii*) are locally abundant. Communities dominated by Basin wildrye (*Leymus cinereus*) are found in scattered depressions between lava ridges and in other areas having deep soils. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is common at slightly higher elevations in the southwest and east of the INEEL. Prickly phlox (*Leptodactylon pungens*) is a common forb.

Limited riparian communities including cottonwood, willow, waterbirch, and chokecherry occur along the Big Lost River and Birch Creek. Intermittent natural wetlands include the rivers and creeks, playas that may fill in the spring, and the Big Lost River sinks. Anthropogenic wetlands include permanent evaporation ponds and drainage ditches as well as a series of spreading areas near the southwest corner of the site. The spreading areas are used to contain water from the Big Lost River when high flow occurs.

According to the 1997 *INEEL Comprehensive Facility and Land Use Plan* (DOE-ID 1997), 275 vertebrate species have been observed at the INEEL, including 43 mammal, 210 bird, 11 reptile, nine fish, and two amphibian species. Seasonal or migratory visitors compose the majority of the species. A large number of the seasonal vertebrates are birds. Among these species is the bald eagle, which is seen on or near the Site during winter. Raptors and songbirds are important ecological components of the sagebrush-steppe community. The INEEL is inhabited by 14 species of sparrows and allies, six species of swallows, 20 species of ducks and geese, and 24 species of raptors (Craig 1979; Arthur et al. 1984).

Thirty-four species observed at the INEEL are considered game species; of these, waterfowl constitute the largest number of species present. Waterfowl use wetland and riparian habitat associated with the Big Lost River and ponds or impoundments at INEEL facilities. However, the most common game species are the mourning dove (*Zenaida macroura*), pronghorn, and sage grouse found in upland habitats. The INEEL provides an important habitat for big game. Approximately 30% of Idaho's pronghorn population may use the INEEL for winter range (DOE-ID 1997). In addition, a small population of elk (*Cervus elaphus*) has become resident on the INEEL. Because of hunting restrictions, this herd of elk grew dramatically from a very small number. To abate damage to crops on adjacent lands in 1993, the INEEL and the State of Idaho implemented a live-trap removal program to limit the size of the elk population (INEL 1993). Some small mammal species such as the black-tailed jackrabbit (*Lepus californicus*) exhibit large population fluctuations and influence the abundance, reproduction, and migration of predators such as the coyote (*Canis latrans*), bobcat (*Felis rufus*), and raptors. Other observed predators include mountain lions and badgers.

The biological diversity of invertebrate fauna at the INEEL has not been investigated extensively; however, 740 insect species have been collected and identified at the INEEL. The harvester ant (*Pogonomyrmex salinus*), in particular, has received attention during the past decade because of its general importance in desert ecosystem energy cycling (Clark and Blom 1988; 1991). At the nearby Craters of the Moon National Monument, where a thorough invertebrates inventory has been done, 2,064 species were found (DOE 1997); therefore, many more insect species may be present at the INEEL.

Six fish species have been observed in the Big Lost River on the INEEL during years when water flow is sufficient (Arthur et al. 1984) The river flows intermittently across about 50 km (31 mi) of the INEEL, from southwest to north, before it terminates in the Big Lost River sinks. Because of periods of drought and upstream water diversion for agricultural and flood-prevention purposes, flow does not reach the INEEL section of the river for years at a time; therefore, aquatic species are not present in the INEEL section of the river during such periods.

The only permanent sources of surface water on the INEEL are manmade ponds where flows are sustained through facility operations. These ponds represent important habitat on the INEEL that would not exist otherwise. The role and ecological significance of ephemeral playa wetlands on the INEEL has not been studied and is poorly understood (Hampton et al. 1995). But, because these areas hold water for various periods, they may be important as breeding habitat for insects and may supply physiological water needs for bird, mammal, and reptile species. These areas also produce increased vegetation suitable for cover and forage.

Sagebrush communities at the INEEL typically support a number of species including sage grouse (*Centrocercus urophasians*), sage sparrow, (*Amphispiza belli*), pygmy rabbit (*Brachylagus idahoensis*), and pronghorn (*Antilocapra americana*). Rock outcropping associated with these communities also provides habitat for species such as bats and woodrats (*Neotoma cinerea*). Grasslands serve as habitat for species including the western meadowlark (*Sturnella neglecta*) and mule dear (*Odocoileus hemionus*). Facility structures at the INEEL also provide important wildlife habitat. Buildings, lawns, ornamental vegetation, and ponds are used by a number of species such as waterfowl, raptors, rabbits, and bats. Aquatic vertebrates are supported year-round by habitat provided by facility treatment ponds, waste ponds, and facility drainages (Ciemenski 1993).

Threatened or endangered species (T/E), species of concern, and sensitive species that use habitats at the INEEL are listed on Table 2-1. T/E species include the peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*). In addition to the bald eagle and peregrine falcon, twenty-four species important to agencies including the U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, U.S. Forest Service, and BLM have been observed at the INEEL (see Table 2-1). Former Category 2 (C2) species of interest include the northern goshawk (*Accipiter gentilis*), ferruginous hawk (*Buteo regalis*), loggerhead shrike (*Lanius ludovicianus*), burrowing owl (*Athene cunicularia*), black tern (*Chlidonias niger*), white-faced ibis (*Plegadis chihi*), trumpeter swan (*Cygnus buccinator*), pygmy rabbit (*Brachylagus idahoensis*), Townsend's western big-eared bat (*Corynorhinus townsendii*), long-eared myotis (*Myotis evotis*), small-footed myotis (*Myotis ciliolabrum*), and the sagebrush lizard (*Sceloporus graciosus*). The USFWS no longer maintains a candidate species (C2) listing but addresses former C2 species as "species of concern" (USFWS 1996). The C2 designation is retained here to maintain the consistency with INEEL ERAs conducted prior to the change in USFWS listing procedures.

Ecological research has been conducted at the INEEL since the 1950s. Organizations participating in this research include DOE-ID, the Environmental Science and Research Foundation, the Environmental and Life Science Department of Lockheed Martin Idaho Technologies Company (LMITCO), and various universities such as Idaho State University, University of Idaho, Colorado State University, and Washington State University. The *Guidance Manual for Conducting Screening-Level Ecological Risk Assessments at the INEL* (VanHorn, Hampton, and Morris 1995) provides a summary of the previous ecological investigations pertinent to the INEEL.

The varying behaviors of the wildlife species potentially present at the INEEL include, but are not limited to, grazing and browsing on vegetation, burrowing and flying, and preying on insects and small mammals. The complexity of these behaviors is significant when considering fate and transport of contaminants and the possibility of exposure to contamination. Subsurface contamination can become surface contamination when translocated by burrowing animals, or can be introduced into the food web when plants take up contamination and are then ingested by an herbivore. If prey, such as a small mammal, becomes contaminated by ingesting contaminated soil or vegetation, and is then captured by a

Table 2-1. Threatened and endangered species, species of concern, and sensitive species that may be found on the INEEL.[a] Species in bold will be individually assessed in the OU 10-04 Ecological Risk Assessment (ERA).

Common names	Scientific name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Plants					
Lemhi milkvetch	*Astragalus aquilonius*	—	S	S	S
Painted milkvetch[e]	*Astragalus ceramicus var. apus*	3c	R	—	—
Plains milkvetch	*Astragalus gilviflorus*	NL	1	S	S
Winged-seed evening primrose	*Camissonia pterosperma*	NL	S	S	—
Nipple cactus[e]	*Coryphantha missouriensis*	NL	R	—	—
Spreading gilia	*Ipomopsis (=Gilia) polycladon*	NL	2	S	—
King's bladderpod	*Lesquerella kingii var. cobrensis*	—	M	—	—
Tree-like oxytheca[e]	*Oxytheca dendroidea*	NL	R	R	—
Inconspicuous phacelia[d]	*Phacelia inconspicua*	C2	SSC	S	S
Ute ladies' tresses[f]	*Spiranthes diluvialis*	LT	—	—	—
Puzzling halimolobos	*Halimolobos perplexa var. perplexa*	—	M	—	S
Birds					
Peregrine falcon	**Falco peregrinus**	**LE**	**E**	**—**	**—**
Merlin	*Falco columbarius*	NL	—	S	—
Gyrfalcon	*Falco rusticolus*	NL	SSC	S	—
Bald eagle	***Haliaeetus leucocephalus***	**LT**	**T**	**—**	**—**
Ferruginous hawk	***Buteo regalis***	**C2**	**SSC**	**S**	**—**
Black Tern	***Chlidonias niger***	**C2**	**—**	**—**	**—**
Northern pygmy owl[d]	*Glaucidium gnoma*	—	SSC	—	—
Burrowing owl	***Athene (=Speotyto) cunicularia***	**C2**	**—**	**S**	**—**
Common loon	*Gavia immer*	—	SSC	—	—
American white pelican	*Pelicanus erythrorhynchos*	—	SSC	—	—
Great egret	*Casmerodius albus*	—	SSC	—	—
White-faced Ibis	***Plegadis chihi***	**C2**	**—**	**—**	**—**
Long-billed curlew	*Numenius americanus*	3c	—	S	—
Loggerhead shrike	***Lanius ludovicianus***	**C2**	**NL**	**S**	**—**
Northern goshawk	***Accipiter gentilis***	**C2**	**S**	**—**	**S**
Swainson's hawk	*Buteo swainsoni*	—	—	S	—
Trumpeter Swan	***Cygnus buccinator***	**C2**	**SSC**	**S**	**S**
Sharptailed grouse	*Tympanuchus phasianellus*	C2	—	S	S
Boreal owl	*Aegolius funereus*	—	SSC	S	S

Table 2-1. (continued).

Common names	Scientific name	Federal Status[b,c]	State Status[c]	BLM Status[c]	USFS[f] Status[c]
Flammulated owl	*Otus flammeolus*	—	SSC	—	S
Mammals					
Gray wolf	***Canis lupus***	**LE/XN**	**E**	—	—
Pygmy rabbit	***Brachylagus (=Sylvilagus) idahoensis***	**C2**	**SSC**	**S**	—
Townsend's western big-eared bat	***Corynorhinus (=Plecotus) townsendii***	**C2**	**SSC**	**S**	**S**
Merriam's shrew	*Sorex merriami*	—	S	—	—
Long-eared myotis	***Myotis evotis***	**C2**	—	—	—
Small-footed myotis	***Myotis ciliolabrum (=subulatus)***	**C2**	—	—	—
Western pipistrelle[d]	*Pipistrellus hesperus*	NL	SSC	—	—
Fringed myotis[d]	*Myotis thysanodes*	—	SSC	—	—
California Myotis[d]	*Myotis californicus*	—	SSC	—	—
Reptiles and Amphibians					
Northern sagebrush lizard	***Sceloporus graciosus***	**C2**	—	—	—
Ringneck snake[d]	*Diadophis punctatus*	C2	SSC	S	—
Night snake[e]	*Hypsiglena torquata*	—	—	R	—
Insects					
Idaho pointheaded grasshopper[d]	*Acrolophitus punchellus*	C2	SSC	—	—
Fish					
Shorthead sculpin[d]	*Cottus confusus*	—	SSC	—	—

a. This list was compiled from the U.S. Fish and Wildlife Service (USFWS) (letter dated July 16, 1997) the Idaho Department of Fish and Game Conservation Data Center threatened, endangered, and sensitive species for the State of Idaho (CDC 1994 and IDFG web site 1997) and RESL documentation for the INEL (Reynolds 1994; Reynolds et al. 1986).

b. The USFWS no longer maintains a candidate (C2) species listing but addresses former listed species as "species of concern" (USFWS April 30, 1996). The C2 designation is retained here to maintain consistency between completed and ongoing INEEL ERAs.

c. Status Codes: INPS–Idaho Native Plant Society; S–sensitive; 2–State Priority 2 (INPS); 3c–no longer considered for listing; M–State monitor species (INPS); NL–not listed; 1–State Priority 1 (INPS); LE–listed endangered; E–endangered; LT–listed threatened; T–threatened; XN – experimental population, non-essential; SSC–species of special concern; and C2 – see item b, formerly Category 2 (defined in CDC 1994). BLM–Bureau of Land Management; R – removed from sensitive list (non-agency code added here for clarification).

d. No documented sightings at the INEEL, however, the ranges of these species overlap the INEEL and are included as possibilities to be considered for field surveys.

e. Recent updates resulting from Idaho State Sensitive Species meetings (BLM, USFWS, INPS, USFS) - (INPS 1995;1996; 1997; 1998)

f. United States Forest Service (USFS) Region 4 predator, such as a ferruginous hawk, the contamination can be taken off-Site when the hawk returns to its nest to feed nestlings. Scenarios for potential exposure of fauna to INEEL contaminants are discussed in Appendix D1. Though some population studies have been conducted for cyclic rabbit and rodent populations and several game species (e.g., pronghorn antelope, sage grouse, and raptors), no recent comprehensive studies have been conducted to assess INEEL-wide wildlife population status and trends associated with contaminant effects.

2.7 Demography and Land Use

2.7.1 Demography

Populations potentially affected by WAGs 6 and 10 activities include government contractor personnel employed at the INEEL, ranchers who graze livestock in areas on or near the INEEL, occasional hunters on or near the INEEL, and residential populations in neighboring communities. No resident populations are located within the INEEL Site boundary, and no residents are located in the vicinity of WAGs 6 or 10 (Figure 2-12).

2.7.1.1 On-Site Populations. The nine separate INEEL facilities (or structures) include approximately 450 buildings and more than 2,000 support facilities. In August 1996, the INEEL employed 8,044 contractor and government personnel; though none are employed at the WAGs 6 or 10 sites with the exception of tour guides at the EBR-I facility from Memorial Day to Labor Day. Employee totals at other INEEL locations were approximately 781 at CFA, 323 at TAN, 424 at TRA, 199 at RWMC, 1,093 at National Reactors Facility (NRF), and 1,129 at INTEC (INEL 1996).

2.7.1.2 Off-Site Populations. Five counties border the INEEL: Bingham, Bonneville, Butte, Clark, and Jefferson. Major communities include Blackfoot and Shelley in Bingham County, Ammon and Idaho Falls in Bonneville County, Arco in Butte County, and Rigby in Jefferson County. Population estimates for the counties surrounding the INEEL and the largest population centers in these counties are shown in Table 2-2.

2.7.2 Land Use

2.7.2.1 Current. The BLM classifies INEEL land as industrial and mixed use (DOE 1991). The primary INEEL land uses are facility and program operations and buffers and safety zones around the facilities. Virtually all the work at the INEEL is performed within the Site's primary facility areas (e.g., CFA and TRA). Approximately 2% (4,600 ha [11,400 acres]) of the Site is used for building and support structures totaling 279,000 m^2 (3,000,000 ft^2) of floor space and supporting infrastructure operations.

The remaining INEEL land, which is largely undeveloped, is used for environmental research, ecological preservation, sociocultural preservation, grazing, and some forms of recreation (DOE-ID 1997). A National Environmental Research Park (NERP), designated in 1975, is used as a controlled outside laboratory in which scientists can study environmental changes caused by human activities. A number of INEEL facilities are capable of producing stresses on the environment. Opportunities for significant research exist in Site-wide studies of these stresses and potential mitigative measures. A substantial body of geological, hydrological, wildlife, vegetation, and meteorological information has been collected for more than 40 years.

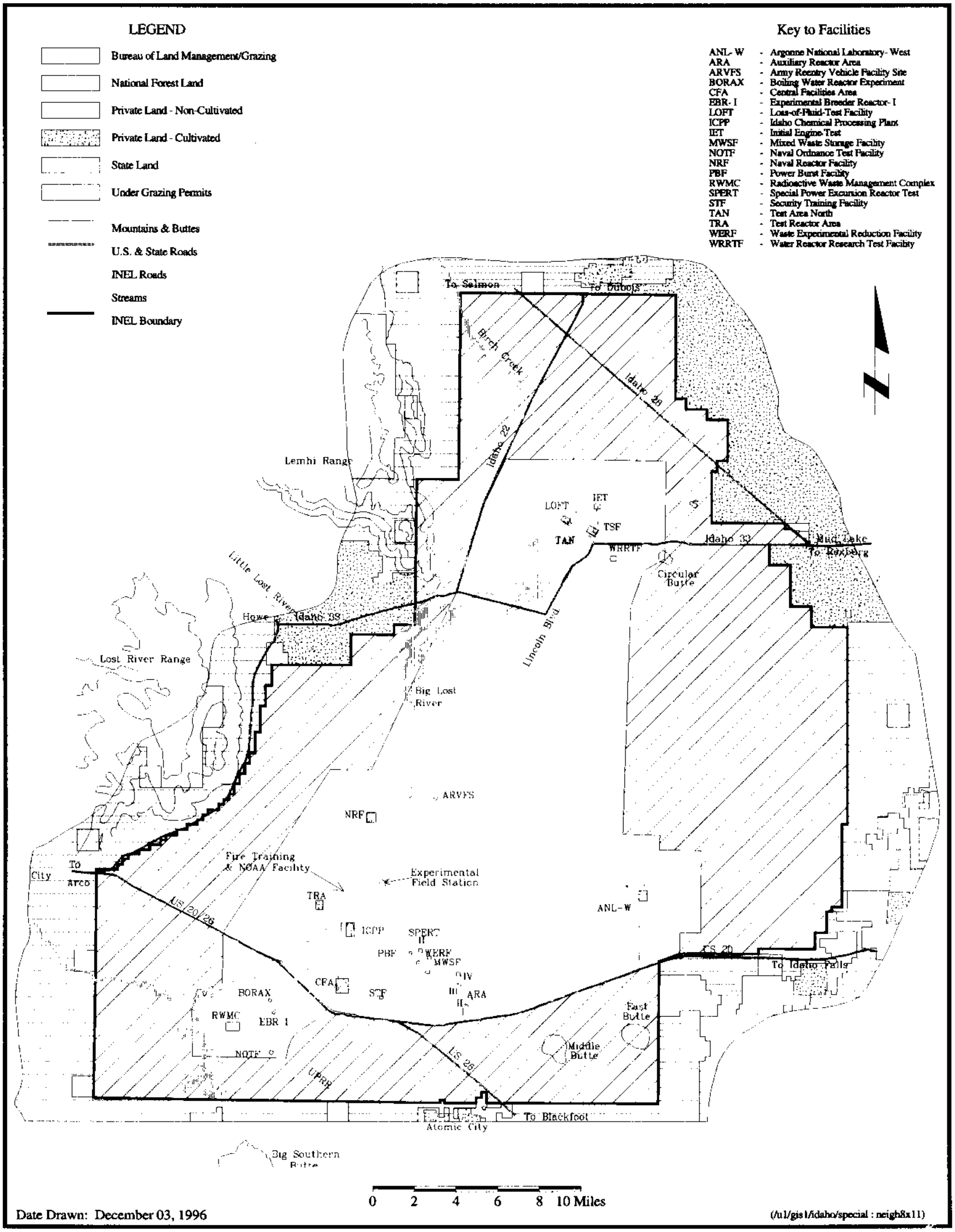


Figure 2-12. Land ownership distribution in the vicinity of the INEEL and on-Site areas open for permit grazing.

Table 2-2. The 1996 population estimates for counties surrounding the INEEL and selected communities.[a]

Location	Population Estimate
Bingham County	41,188
Blackfoot	10,406
Shelley	3,803
Clark County	822
Bonneville County	79,531
Ammon	5,849
Idaho Falls	48,079
Butte County	3,008
Jefferson County	18,786
Rigby	2,703

a. Source: Idaho Department of Commerce, July 1998.

The developed area within the INEEL is surrounded by a 1,295-km^2 (500-mi^2) buffer zone of grazing land for cattle and sheep (DOE 1991). The DOE and the U.S. Department of the Interior mutually agree on the acreage allocated for grazing at the INEEL. The U.S. Department of the Interior administers the area through BLM grazing permits. Grazing is not allowed within 3.2 km (2 mi.) of any nuclear facility, and dairy cattle are not permitted. The area used for grazing ranges from 121,410 and 141,645 ha (300,000 and 350,000 acres). The U.S. Sheep Experiment Station, located approximately 42.6 km (26.5 mi) northeast of the Site, uses a 364-ha (900-acre) portion of the INEEL as a winter feed lot for approximately 5,000 sheep.

Depredation hunts, managed by the Idaho Department of Fish and Game, are permitted on-Site during selected years. Hunters are allowed 0.8 km (0.5 mi.) inside the INEEL boundary on portions of the northeastern and western borders of the Site (Hull 1989).

State Highways 22, 28, and 33 cross the northeastern portion of the Site, and U.S. Highways 20 and 26 cross the southern portion. The public uses a total of 145 km (90 mi.) of paved highways that pass through the INEEL (DOE 1991). Fourteen miles of Union Pacific Railroad traverses the southern portion of the Site. A government-owned railroad runs from the Union Pacific tracks through CFA to NRF, and a spur from the Union Pacific runs to RWMC.

In the counties surrounding the INEEL, approximately 45% of the land is agricultural, 45% is open land, and 10% is urban (DOE 1991). Agricultural uses include production of sheep, cattle, hogs, poultry, and dairy cattle (Bowman et al. 1984). The major crops produced on land surrounding the INEEL are wheat, alfalfa, barley, potatoes, oats, and corn. Sugarbeets are grown within about 64 km (40 mi) of the INEEL in the vicinity of Rockford, Idaho, in central Bingham County and southeast of the INEEL (Table 2-3). Most of the land surrounding the INEEL is owned by private individuals or the U.S. Government and is administered by the BLM.

2.7.2.2 Future Land Use. The INEEL is likely to continue as an industrial and research facility (DOE-ID 1997), with moderate growth expected for the next 20 years. Agricultural and open land will continue to surround the INEEL. The WAG 6 EBR-I site will remain recreational and industrial, and the

Table 2-13. Acreage of major crops harvested in counties surrounding the INEEL (1994–95).[a]

County	Wheat	Alfalfa	Barley	Potatoes	Sugarbeets	Oats	Silage Corn
Bingham	129,700	52,300	26,700	65,800	11,500	600	
Bonneville	59,500	43,100	61,100	37,900		500	
Butte	8,700	32,400	15,600	3,400		500	
Clark	11,700	16,500	1,000	12,500		200	
Jefferson	44,600	92,100	49,000	26,600		800	1,400

a. Source: Idaho 1996.

BORAX site will remain industrial for a minimum of 100 years. Waste Area Group 10 will remain agricultural, industrial, and recreational for the next 100 years. Other less likely INEEL land uses include agriculture and the return of on-Site areas to their natural, undeveloped state. Future land use is addressed in the INEEL future land-use scenarios document (DOE-ID 1997). Because of the uncertainty in developing land-use scenarios, assumptions were made for defining factors such as development pressure, advances in research and technology, and ownership patterns. The following assumptions for the INEEL apply to OU 10-04:

- The INEEL will remain under government ownership and control for at least the next 100 years.
- The life expectancy of current and new facilities is expected to range between 30 and 50 years. The D&D process will commence following closure of a facility if a new mission for the facility is not determined.
- No residential development (e.g., housing) will occur within the INEEL boundaries for the next 100 years.
- No new major, private developments (residential or nonresidential) are expected in areas adjacent to the INEEL.

2.7.3 Water Use and Supply

2.7.3.1 On-Site. Production wells to the SRPA are the source of all water used at the INEEL. Approximately 8 million m^3/year (282 million ft^3/year) are drawn from the 30 on-Site production wells (DOE 1991). Active production wells are located at CFA, RWMC, ANL-W, TAN, NRF, TRA, and INTEC.

2.7.3.2 Off-Site. Upstream of the INEEL, the Big Lost River, Little Lost River, and Birch Creek are used as sources of water for agriculture. In years of high flow, Birch Creek terminates at a playa near the north end of the Site. The Little Lost River terminates at a playa just north of the central northwestern boundary of the INEEL. The Big Lost River flows onto the INEEL near the Sites southwestern corner, bends to the northeast, and flows northeastward to the Big Lost River playas. The surface water that reaches the INEEL is not used for any purpose. No surface-water streams flow off the INEEL with the potential exception of diverted water exiting Spreading Area D during extremely wet or high water conditions.

Regionally, approximately 1.8 billion m^3/yr (63 billion ft^3/yr) of water is drawn from the aquifer in the ESRP for agricultural use (DOE 1991). Most cattle and sheep grazing in the vicinity of the INEEL are near wells or spring developments. Drinking water in the region is obtained almost exclusively from the aquifer.

2.8 Waste Area Groups 6 and 10 Contamination History

The OU 10-04 RI/FS will evaluate environmental contamination in the WAGs 6 and 10 areas. Past scientific and engineering research at EBR I, BORAX, and miscellaneous WAG 10 sites contaminated the environment with chemical and radioactive waste. Numerous leaks and spills associated with industrial processes or D&D activities also have caused environmental contamination.

2.8.1 Waste Area Group 6

Waste Area Group 6 currently includes 22 potential release sites divided into five OUs (OU 6-01; 6-02; 6-03, 6-04, and 6-05). Sites within these OUs include USTs, septic tanks, two reactor burial sites, a leach pond, a trash dump, a drainage ditch, and a radionuclide-contaminated soil area. Contaminants of potential concern include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), radionuclides, petroleum waste, heavy metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides. Summary assessments, Track 1 Decision Documentation Packages (DDP) and Track 2 investigations and one RI/FS have been completed for potential release sites.

Five sites categorized as not belonging to an OU were designated as "No Action" sites in the FFA/CO (DOE-ID 1991). In general, these were Consent Order and Compliance Agreement (COCA) sites (COCA 1987) that were subsequently found to require no further action under the FFA/CO or as documented in the administrative record. These sites include the EBR-02—EBR-I Septic Tank (AEF-702) and Seepage Pit (AEF-703); EBR-03—the EBR-I Seepage Pit (WMO-702); EBR-04—the EBR-I Septic Tank (WMO-701); EBR-05—the EBR-I Cesspool, Septic Tank (EBR-709), and Seepage Pit (EBR-713); and EBR-06—the EBR-I Septic Tank (EBR-714) and Seepage Pit (EBR-716).

With the exception of EBR-03 and EBR-04, these sites will not be revisited in the OU 10-04 RI/FS. In 1995, as part of D&D, a radionuclide-contaminated product was discovered in EBR-04, and EBR-03 is an associated system. The tank, piping, and contents were removed and disposed accordingly. Because of the uncertainty in the data collected from the soil, this site will be retained for evaluation in the OU 10-04 RI/FS. The assessment will include extrapolating data collected from within the system to the soil as a worst case scenario, which is expected to result in a no further action recommendation. As explained in Section 3.6, EBF-709 and EBR-713 are considered part of the EBR-I facility, which will be assessed as a facility assessment site.

2.8.1.1 Operable Unit 6-01. Operable Unit 6-01 consists of BORAX-02, which is the BORAX I reactor burial site, located in the southwestern portion of the INEEL about 832 m (2,730 ft) northwest of EBR-I. The site consists of buried debris and contaminated soil from the intentional destruction of the BORAX I reactor in 1954. This OU was originally scheduled for a Track 2 investigation, but was incorporated into the OU 5-05 (SL-1 Reactor Burial Site) RI/FS (LMITCO 1995) because of similarities between the two burial sites. The OU 6-01 was capped as part of the OU 5-05/6-01 RI/FS and Record of Decision (ROD). Contaminants of potential concern are limited to radionuclides originating from reactor excursions (Cs-137 and Sr-90). Most of the site's contamination has been covered by the cap, but a small area of Cs-137 contamination was discovered outside of the southeast edge of the cap during surveys conducted in 1998.

Because of the proximity to other BORAX sites, the BORAX-02 site will be retained for evaluation of cumulative risk in the OU 10-04 RI/FS using existing data from the OU 5-05/6-01 RI/FS (LMITCO 1995). In addition, determination of ecological risk was deferred to the OU 10-04 RI/FS.

2.8.1.2 Operable Unit 6-02. Operable Unit 6-02 comprises the BORAX-01—BORAX II–V Leach Pond; BORAX-03—BORAX Septic Tank (AEF-703); BORAX-04—BORAX Trash Dump; BORAX-08—BORAX V Ditch; and BORAX-09—BORAX II–V Reactor Building.

The BORAX-01 leach pond received reactor cooling water and cooling tower blowdown water generated during the BORAX II–V reactor program. Characterization included soil sampling, an aerial radiological survey, D&D activities, and a Track 1 investigation. This site also was included in the *Remedial Investigation/Feasibility Study Report for Operable Unit 10-06: Radionuclide-Contaminated Soils at the Idaho National Engineering Laboratory,* (LMITCO 1996). Using existing data, the BORAX-01 site will be retained for evaluation of cumulative human health risk and ecological risk in the OU 10-04 RI/FS.

The BORAX-03 septic tank (AEF-703) was a 2,271-L (600-gal) concrete underground septic tank and its associated piping, distribution box, and leach field, located 15 m (50 ft) west of AEF-605. The septic system, installed in 1962 and used until 1968, received sewage from a floor drain, service sink, urinal, and commode. The septic tank and system were removed as part of 1995–1996 D&D activities. A Track 1 DDP recommending "No Further Action" was approved for BORAX-03 in 1994; therefore, this site will not be evaluated further in the OU 10-04 RI/FS.

The BORAX-04 trash dump was located 137 m (450 ft) from the northwest corner of the BORAX-V facility fence. It was used during construction, operation, and demolition of BORAX facilities from 1953 to 1964. All waste material was removed and the area was backfilled with noncontaminated soil, graded, and reseeded during 1985 D&D activities. A Track 1 DDP was approved in 1994 recommending "No Further Action" for BORAX-04; therefore, this site will not be evaluated further in the OU 10-04 RI/FS.

The BORAX-08 ditch (a newly identified site) was an unlined excavation that began approximately 12 m (40 ft) north of the AEF-601 reactor facility and measured approximately 477 m (1,565 ft) in length and 15 m (50 ft) in width at its widest point. It received waste stream effluent from the BORAX II–V reactors through a 10-cm (4-in.) raw water line to a 23-cm. (9-in.) corrugated underground metal pipe. Sample analyses indicated that the ditch contained radioactive and metals contamination. This site was included in the OU 10-06 RI/FS and an NTCRA was conducted at BORAX-08 in 1995. Approximately 903 m^3 (1,178 yd^3) of radionuclide-contaminated soil were excavated and samples were collected to verify clean-up goals were met. This site has been retained to evaluate human health and ecological risk in the OU 10-04 RI/FS using NTCRA data.

The BORAX-09 site (a newly identified site), the BORAX II–V Reactor Facility (AEF-601/ANL-717), was the site of a series of reactor experiments conducted between 1953 and 1964. A D&D removal and containment action was conducted at BORAX-09 during 1996 and 1997 to remove RCRA (42 USC § 6901 et seq.) hazardous materials and leave the site in a safe and stable condition. A contamination source (radionuclide contaminated soil) remains in place. The BORAX-09 site will be retained for evaluation of cumulative and ecological risk in the OU 10-04 RI/FS using D&D data.

2.8.1.3 Operable Unit 6-03. Operable Unit 6-03 consisted of ten inactive USTs: BORAX-05—BORAX fuel oil tank SW of AEF-602; BORAX-07—BORAX inactive fuel oil tank by AEF-601; EBR-07—EBR-I (AEF-704) fuel oil tank at AEF-603; EBR-08—EBR-I (WMO-703) fuel oil tank; EBR-09—EBR-I (WMO-704) fuel oil tank at WMO-601; EBR-10—EBR-1 (WMO-705) gasoline tank; EBR-11—EBR-I fuel oil tank (EBR-706); EBR-12—EBR-I diesel tank (EBR-707); EBR-13—EBR-I gasoline tank (EBR-708); and EBR-14—EBR-I gasoline tank (EBR-717). Track 1 DDPs were approved for each site recommending No Further Action; however, because of known leaks, EBR-08 will be retained in the OU 10-04 RI/FS for further evaluation of ecological and human health risk and EBR-09, EBR-10, EBR-11, and EBR-12 will be retained for further evaluation of ecological risk.

2.8.1.4 Operable Unit 6-04. Operable Unit 6-04 consisted of the EBR-15 radionuclide-contaminated soil comprising four regions surrounding the EBR-601 reactor facility. A Track 1 investigation was conducted and then this site was included in the OU 10-06 Radionuclide-Contaminated Soil RI/FS. Samples collected from EBR-15 during OU 10-06 characterization contained radionuclide concentrations high enough to warrant accelerated cleanup. A NTCRA was conducted at EBR-15 in 1995. This activity included excavation of radionuclide-contaminated soil, approximately 980 m^3 (1,279 yd^3), from all detectable sources within the EBR-I perimeter fence. Following radionuclide-contaminated soil excavation, samples were collected to verify cleanup goals were met. Based on field readings, less than 0.9 m^3 (1 yd^3) of radionuclide-contaminated soil exceeding preliminary NTCRA remediation goals remains in one small area where a fence post and basalt outcropping prevented its complete removal. In addition, because the scope of OU 10-06 was radionuclide-contaminated soil, some radionuclide-contaminated piping was left underground when uncovered. The EBR-15 site will be retained in the OU 10-04 RI/FS for calculation of human health and ecological risk using existing data. Preexcavation data will be used to calculate risk for the soil around the fence post. Verification sampling data will be used for all other excavated areas. A new site identification form (NSIF) is in progress for the underground piping to determine if the piping should become a CERCLA site.

2.8.1.5 Operable Unit 6-05. Operable Unit 6-05 is the WAG 6 Comprehensive RI/FS. In accordance with the FFA/CO (DOE-ID 1991), the WAG 6 Comprehensive RI/FS will be incorporated into the OU 10-04 comprehensive RI/FS.

2.8.2 Waste Area Group 10

Waste Area Group 10 consists of potential release sites divided into seven OUs. The sites include disposal pits, a leach pond, ordnance areas, radionuclide-contaminated soil areas, sumps and pits, a gun range, and a buried telecommunications cable. Contaminants of potential concern include VOCs, SVOCs, radionuclides, petroleum waste, heavy metals, unexploded ordnance (UXO), and high explosive residue. Except as mentioned in Section 1, summary assessments, Track 1 DDPs and Track 2 investigations have been completed for all potential release sites.

Nine sites categorized as not belonging to an OU were designated as "No Action" sites in the FFA/CO (DOE-ID 1991). These sites were originally COCA sites that were subsequently found to require "No Further Action" as documented in the FFA/CO or the administrative record. These sites included the Army Reentry Vehicle Facility Site (ARVFS)-01—an earth-covered bunker containing four vessels of contaminated NaK; ARVFS-02—a low-level radioactively-contaminated tank; Dairy Farm (DF)-01—the DF disposal pit; EOCR-01 Leach Pond; EOCR-02 Injection Well; EOCR-03 Oxidation

Pond; EOCR-04 Septic Pond; EOCR-05 Blowdown Sump; and ZPPR-01 Disposal Pit (outside the ANL-W fence).

With the exception of EOCR-03, which will be evaluated for human health and ecological risk, these sites will not be investigated further in the OU 10-04 RI/FS. The ARVFS bunker, clean-closed under RCRA in FY-96 and demolished in October 1996, will not be retained in the OU 10-04 RI/FS. The EOCR-03 oxidation pond may contain lead and asbestos in the inlet pipe and will be retained for further evaluation.

2.8.2.1 Operable Unit 10-01. Operable Unit 10-01 comprises the LCCDA-01 and LCCDA-02, two disposal pits located in the southwest corner of the INEEL, approximately 1 km (0.6 mi) east of the main RWMC entrance. The LCCDA pits were used primarily for disposal of solid and liquid corrosive chemicals such as nitric acid, sulfuric acid, and sodium hydroxide. A solitary disposal request uncovered as part of the Track 2 investigation (Hull 1994) suggested that some organics may have been disposed to LCCDA although sample results from the same investigation indicated that no SVOCs or VOCs are present. Because uncertainty existed that was unacceptable to the agency remedial project managers, the Track 2 investigation in 1994 and 1995 resulted in a determination to further evaluate the pits, in the OU 10-04 RI/FS. The pits were sampled in 1997 for surficial radionuclides and subsurface organic compounds.

These 1997 data will be used in the OU 10-04 RI/FS. Briefly, surficial radionuclides detected in 1997 include U-234, U-238, Sr-90, Cs-137, and U-235 in concentrations up to 5.6 ± 0.4, 5.5 ± 0.4, 0.8 ± 0.2, 0.7 ± 0.09, and 0.2 ± 0.03, pCi/g, respectively. Detectable levels of 1,1,1-TCA, CCl4, TCE, and chloroform vapors were measured at LCCDA. Of these, the contaminant with the highest relative concentration was CCl4, followed by TCE. Background grids were sampled near LCCDA for organic compounds approximately 462 m (1,500 ft) east (toward EBR-I) and west (toward RWMC). All the compounds detected at LCCDA were also detected in the two background grids. Maximum values were consistently lower toward EBR-I and higher toward RWMC for CCl4, trichloroethene, and chloroform.

Historically, carbon tetrachloride has been detected in the groundwater and vadose zone near LCCDA, reaching levels of 7 μg/L at well M10S (near the RWMC), and 5 μg/L at well M7S (near LCCDA) (Becker et al. 1997). Given the elevated organic vapor background "noise" in the RWMC/LCCDA area, it is difficult to attribute any organic compound to LCCDA from the 1997 data, but the higher values towards the RWMC suggest the CCl4 source is the RWMC and not the LCCDA. Though LCCDA is the possible source of CCl_4 measured in Well M7S, it should be noted that an estimated 490,000 kg of CCL_4 (Miller and Navratil 1998) were disposed of at the RWMC. For comparison, the solitary disposal request (unverified as an actual disposal at LCCDA) for 6,237 L (1,650 gal) of "waste oil and solvents" amounts to approximately 7,000 kg (Hull 1994). Additional sampling may be warranted to determine the source of organic vapors in the vadose zone in the RWMC area, but it will be a WAG-7 task. The LCCDA has been retained for evaluation of cumulative and ecological risk using existing data in the OU 10-04 RI/FS.

2.8.2.2 Operable Unit 10-02. Operable Unit 10-02 comprises the OMRE-1 leach pond. The OMRE was a 12-MW thermal reactor that was operated between 1957 and 1963, located in the southern portion of the INEEL approximately 6.25 km (2 mi) east of CFA. The reactor coolant consisted primarily of high-boiling-point organic compounds similar to wax; however, neutron bombardment degraded some compounds to low boiling point organics, including VOCs and SVOCs. Decomposition waste removed during periodic purification was not discharged to the pond, but large quantities of radioactive wastewater, possibly contaminated with organic coolant and decomposition wastes, were discharged to the pond. The site was originally designated as a Track 2 investigation; however, sampling was conducted instead as part of the OU 10-04 RI/FS during FY-97. Groundwater and soil data gaps for organic compounds have been identified for OMRE-1; therefore, this site will be retained for further evaluation in the OU 10-04 RI/FS. Please see Appendix G for details and additional background data. See Section 4.7.1.5 for proposed additional sampling not included in Appendix G.

2.8.2.3 Operable Unit 10-03. Operable Unit 10-03 comprises all ordnance sites including OU 10-05 sites at the INEEL that are known or suspected to be contaminated with unexploded ordnance and high explosives residue from activities associated with the former Naval Proving Ground (Figure 2-13).

An interim action (OU 10-05) on six ordnance sites was performed in 1993. The six sites included the CFA gravel pit (ORD-04), the Explosive Storage Bunkers North of INTEC (ORD-07), the NOAA grid (ORD-08), the CFA-633 area (ORD-03), the Fire Station II area (ORD-10), and the Anaconda Power Line (ORD-11) road. The goals of the interim action were to remove UXO and ordnance explosive waste to a depth of 0.61 m (2 ft) at each site and to remediate soils containing greater than 44 ppm for trinitrotoluene (TNT) or greater than 18 ppm for cyclotrimethylene trinitroamine (Research Development Explosive [RDX]). Approximately 185 yd^3 (686 drums) of explosive contaminated soil were excavated and sent off-Site for incineration. No UXO or ordnance explosive waste were encountered at this time at the CFA gravel pit or the Explosive Storage Bunkers.

CERCLA removal actions were performed in 1994, 1995, 1996, and 1997. During these actions UXO and pieces of explosives (TNT and RDX) were removed from the Naval Ordnance Disposal Area (NODA) (ORD-06), an area located east of Lincoln Boulevard at Milepost 17 (ORD-22), the Rail Car Explosion Area (ORD-19) and adjacent river bed, the Land Mine Fuze Burn Area (ORD-24), the UXO Site East of TRA (ORD-16), the Mass Detonation Area (ORD-13), the NOAA Grid (ORD-08), the Experimental Field Station (ORD-15), the Fire Station II Area (ORD-10), and the Craters East of INTEC (ORD-28). During the 1994 removal action, 90 acres were cleared at the Twin Buttes Bombing Range (ORD-09) however no UXO or explosive residue were encountered. The site contained only inert shells.

A Track 2 investigation and field assessment of 93,155 ha (230,190 acres) was performed in 1996. Twenty-nine potential ordnance sites were identified during the Track 1 and 2 investigations. More acreage was searched than the identified ordnance sites to establish the boundary of the contamination. Bombing ranges were searched on foot by field crews consisting of EOD professionals using approximately 50-m (55-yd) intervals. Each of the 29 originally identified ordnance sites was further assessed using 10-m (11-yd) intervals. The assessment included a visual examination for signs of craters, detonation tests, surface UXO, pieces of explosives, and soil contamination. If signs of UXO were encountered, the field team thoroughly assessed the site in tighter intervals and established and mapped the boundary for future remediation. The Track 2 summary report (Sherwood et al. 1998), including the summaries of each removal action and archived search reports, can be found in the administrative record. The Track 2 decision statement for OU 10-03 has not been signed by the Agency remedial project managers; instead, all ordnance sites will be reevaluated in the OU 10-04 RI/FS for potential of UXO removal and potential institutional controls that may apply.

2.8.2.4 Operable Unit 10-04. Operable Unit 10-04 includes the SRPA and (newly identified sites) STF-601 sumps and pits and the STF gun range. The sumps and pits are located in Building 601 basement and surrounding area. The sumps and pits contain water, and based on high water marks the levels have fluctuated. The fluctuation is likely caused by precipitation entering through the roof and exiting through the basement. The gun range was used for several years by the security force for small caliber hand guns. Approximately 4 to 5 million rounds were fired into the berm. Most rounds were confined to the north berm, but scattered lead is apparent in outlying areas. The berm is approximately

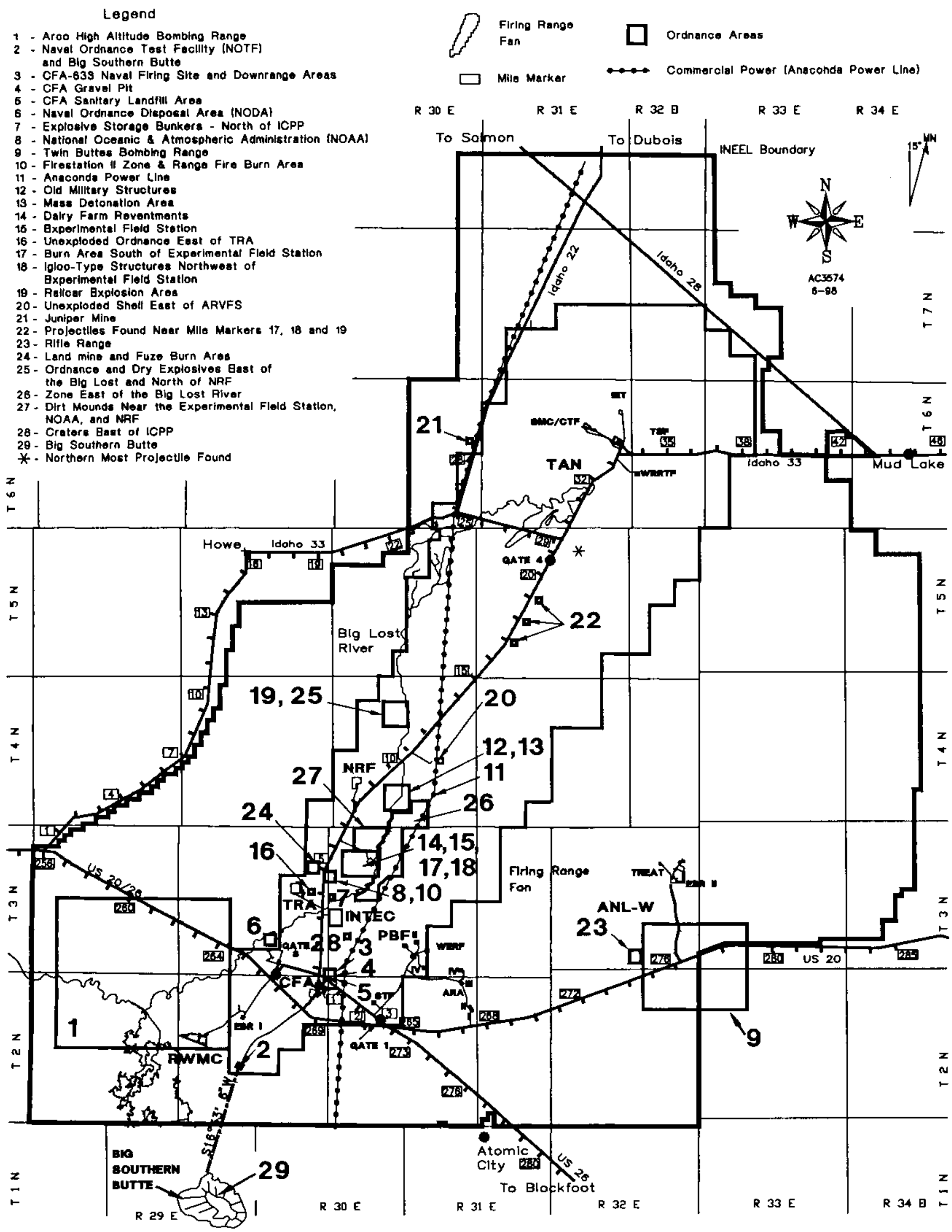


Figure 2-13. INEEL explosive contamination areas.

3 to 3.7-m (10 to 12-ft) high, 6.1 to 7.6-m (20 to 25-ft) wide at the bottom, and 3 m (6 ft) wide at the top. The side berms (east and west) are approximately 61-m (200-ft) long and the north berm is approximately 76-m (250-ft) long. The STF-601 sumps and pits will be sampled in FY-98 by D&D and the STF gun range will be sampled in FY-99. Collected data will be evaluated in the OU 10-04 RI/FS. The SRPA will be evaluated in the OU 10-04 RI/FS.

2.8.2.5 Operable Unit 10-05. Operable Unit 10-05 consisted of an interim action for unexploded ordnance at six sites. These six sites are included as a subset of OU 10-03, which includes all ordnance areas located at the INEEL including NODA. See Section 2.8.2.3 for details.

2.8.2.6 Operable Unit 10-06. Operable Unit 10-06 (newly identified site) is comprised of miscellaneous radionuclide-contaminated soil areas and areas of windblown contamination. These sites were investigated as part of the OU 10-06 RI/FS, which was followed by a NTCRA at six of the sites. Detailed descriptions of the site investigations are found in the *Engineering Evaluation/Cost Analysis for OU 10-06: Radionuclide-Contaminated Soils at the Idaho National Engineering Laboratory,* (Jessmore 1995). Four OU 10-06 sites will be evaluated in the OU 10-04 RI/FS for cumulative risk: (1) BORAX-08 ditch (OU 6-02), (2) EBR-15 radionuclide-contaminated soil area (OU 6-04), (3) EBR-I windblown area, and (4) BORAX windblown area. Both EBR-15 and BORAX-08 were part of the OU 10-06 NTCRA. The EBR-I and BORAX windblown areas did not warrant cleanup based on OU 10-06 criteria.

2.8.2.7 Operable Unit 10-07. Operable Unit 10-07 (newly identified site) consists of a buried telecommunications cable installed in the early 1950s. The cable, approximately 5-cm (2-in.) in diameter, consists of copper wiring with paper insulation enclosed by a 0.32-cm (1/8-in.) thick lead sheathing wrapped in spiraled steel, and enclosed in jute wrapping impregnated with an asphalt-like substance. The cable is buried approximately 0.9 to 1.2-m (3 to 4-ft) deep parallel to and approximately 91 m (100 yd) east of Lincoln Boulevard on the INEEL. The cable originates at CFA and runs along Lincoln Boulevard to TAN. U.S. West Communications cut the cable in the spring of 1990 to render it useless. The cable was added to the FFA/CO in 1993 to address the lead contamination risk under the Track 1 guidance. Soil sampling and a subsequent risk evaluation conducted in 1990 indicated that lead, the hazardous constituent of concern, poses no risk at this site. This site was recommended for "No Further Action" and will not be retained for human health evaluation in the OU 10-04 RI/FS, but will be evaluated for ecological risk.

2.9 Listing of Waste Area Groups at the INEEL

To manage the investigations needed to determine appropriate remedial actions, the INEEL was divided into 10 WAGs (Figure 1-2) in a triparty agreement with the EPA Region 10, DOE-ID, and Idaho Department of Health and Welfare (IDHW) (DOE-ID 1991). Within each WAG, known or suspected areas of contamination are assigned to an OU as a means of controlling investigation and cleanup activity. This strategy allows the EPA Region 10, DOE-ID, and IDHW to focus available cleanup resources, schedule remedial actions, and coordinate CERCLA activities.

The 10 WAGs include the following:

- WAG 1—Test Area North
- WAG 2—Test Reactor Area

- WAG 3—Idaho Chemical Processing Plant
- WAG 4—Central Facilities Area
- WAG 5—Power Burst Facility and Auxiliary Reactor Area
- WAG 6—Experimental Breeder Reactor No. 1
- WAG 7—Radioactive Waste Management Complex
- WAG 8—Naval Reactors Facility
- WAG 9—Argonne National Laboratory-West
- WAG 10—Miscellaneous Sites.

The WAG 10 includes miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included within other WAGs. It also includes regional SRPA concerns related to the INEEL that cannot be addressed on a WAG-specific basis. Specific sites currently recognized as part of WAG 10 include the LCCDA located between WAGs 6 and 7, the OMRE located between WAGs 4 and 5, and former ordnance areas located at numerous sites within the INEEL.

2.10 Definitions of Areas Included in this RI/FS Work Plan

Individual WAG-specific and WAG 10 scoping meetings have resulted in refining the role of WAG 10. For purposes of the OU 10-04 RI/FS, the WAG 10 definition is further defined in terms of surface, groundwater, and ecological scope. The OU 10-04 RI/FS assumptions include elimination of an independent OU 10-02 OMRE leach pond Track 2 assessment, and incorporation of the OU 10-03 ordnance areas Track 2 assessment data and the OU 10-06 radionuclide-contaminated soil areas draft RI/FS. The scheduling assumptions related to the integration with the WAG-specific RI/FSs are discussed in Section 6.

2.10.1 Surface

The FFA/CO defines WAG 10 as the INEEL boundary or beyond, as necessary, to encompass any real or potential impact from INEEL activities and any areas within the INEEL not covered by other WAGs (DOE-ID 1991). Waste Area Group 10 encompasses a large area and much of that area is assumed uncontaminated. The assumed uncontaminated areas will be addressed in the OU 10-04 remedial investigation (RI) and data will be presented in the RI to support their exclusion (completed outside the RI) from the CERCLA site. The sites listed in Table 1-1 (see Subsection 1.3.4) are the only known release sites. There are no plans to expand the scope of the OU 10-04 RI/FS beyond these sites unless new sites are identified in the course of other activities or during implementation of characterization activities. However, the definition of WAG 10 has been updated for scoping the OU 10-04 RI/FS and future NPL deletion.

The WAG 10 area is defined as the INEEL boundary minus WAGs 1 through 5, 7 through 9, and the Jefferson County landfill (58 FR 249). The RPMs determined that the Jefferson County Landfill site was a no further action site at the time the land was turned over to the BLM to sell to Jefferson County for a multi-county landfill.

2.10.2 Groundwater

As defined in the FFA/CO, the WAG 10 Groundwater includes "regional Snake River Plain aquifer concerns related to the INEEL that cannot be addressed on a WAG-specific basis. The boundary of WAG 10 is the INEEL Boundary, or beyond as necessary to encompass real or potential impact from INEEL activities, and any areas within the INEEL not covered by other WAGs."

OU 10-04 is described in the FFA/CO as a "safety net" for the INEEL RI/FS process. As previously discussed, the OU 10-04 RI/FS groundwater assessment will require data from the other Waste Area Group investigations, namely OU 7-13/14 and OU 3-14. However, because of schedule extensions in these other site investigations, some critical data will not be available for the groundwater assessment in the OU 10-04 Comprehensive RI/FS if completed on the FFA/CO schedule. The renegotiated schedule for OU 10-04 divides the OU 10-04 Comprehensive RI/FS into two parts. Part A will complete the OU 10-04 RI/FS activities for sites that do not require additional data from the other Waste Area Groups. Part B (also known as OU 10-08) will complete the assessments that must have supporting data from other WAGs, such as the assessment of groundwater. The draft critical path schedule for these activities is included in Section 6.

The Groundwater Integration Technical Memorandum is currently under development. It will present programmatic direction on how groundwater analyses on an INEEL wide basis will be integrated and will provide guidance that will help avoid duplicative and wasteful effort. Additionally, it will discuss how the "WAG 10 safety net" concept will be incorporated in the first 5-year review of OU 10-04 RI/FS and will address the relationship between OU 10-04, the groundwater components of the Comprehensive RI/FSs, and the final groundwater RODs.

Critical assumptions of the OU 10-04 RI/FS groundwater strategy are that the individual WAGs will model, monitor, and remediate (as needed) to the full extent of their plume, and that the OU 10-04 ROD will select a limited action remedy for groundwater. This limited action remedy will rely principally on monitoring and institutional controls. The strategy assumes that no remedial action will be required under OU 10-04 to protect human health and the environment, because individual WAGs will remediate groundwater as necessary. However, to ensure that important groundwater issues do not "slip between the cracks" at individual WAGs, WAG 10 will staff a position to work with and review all major groundwater related issues and decisions rendered by individual WAGs. The OU 10-04 ROD will outline plans for future monitoring in the Snake River Plain aquifer and integration of 5-year CERCLA reviews.

Because of the large body of evidence and the many years of groundwater study at the INEEL it is assumed that all groundwater areas outside the specified sites and WAGs are uncontaminated and will not be studied further in the RI. Appendix E presents a list of references that support this assumption.

The groundwater concerns identified to date for further investigation during the RI are listed below. Several investigations are planned for addressing these concerns during the RI. The proposed investigations are discussed in Appendix G.

2.10.2.1 Commingled Plumes. A component of the RI groundwater investigation will be a review of INEEL WAG groundwater plumes and a review of predicted plume geometries after the implementation of the selected remedy. A summary table will be prepared during the RI indicating the preliminary and final remediation goals for the aquifer at each WAG, and the WAG-specific receptor location where the concentrations must be met. Where individual WAGs have not evaluated commingling of plumes from different sources, the OU 10-04 RI will evaluate commingling by superimposing plumes from different WAGs on the same map. An appraisal will be made of the depth of each plume within the receptor location. This will be done to determine if a single well would likely commingle contaminants from separate plumes since it is known that the plumes tend to move to deeper depths in the aquifer as they migrate downgradient. To perform the OU 10-04 qualitative assessment and cumulative risk assessment, it is hypothesized that the mapped WAG groundwater modeled plumes for the residential scenario, 100 years in the future for the five contaminants with the most restrictive risk results (five was selected as a reasonable and representative number of contaminants to focus the OU 10-04 assessment), will be superimposed on an INEEL-scale map as a summary of overall modeled aquifer contamination. Further details about the commingled plume analysis will be presented in the OU 10-08 Work Plan.

2.10.2.2 Mud Lake Nitrates and Pesticides. The aquifer beneath the northern portion of the INEEL is contaminated by low levels of nitrates from agricultural processes occurring in the Mud Lake area (Robertson, et al., 1974). An assessment of upgradient water quality for the INEEL will be made to determine the need for groundwater monitoring in this area. This information will provide a record of any contamination moving on to the INEEL from upgradient sources. WAG 10 responsibilities will be to ensure that periodic nitrate sampling is occurring in appropriate upgradient wells. This may be sampling to be performed by the USGS or other entity.

2.10.2.3 Perched Water-Groundwater Interactions. A careful review of WAGs with perched water issues is warranted to ensure that all concerns and issues related to contamination originating from perched water and migrating to the aquifer have been addressed. It is assumed that WAG-specific remedial actions will satisfactorily remediate unacceptable risk posed by any perched water body below specific WAGs.

2.10.3 Ecological Scope

The INEEL has followed a phased approach to performing ERAs as discussed in Section 3 and Appendix D1. Phase 1 and 2 are the performance of the screening and individual WAG ERAs (including the WAG 6 and 10 sites [as discussed in Section 3.2.2 and 3.4]). Phase 3 is the performance of the baseline OU 10-04 ERA. One of the initial activities at the Phase 3 stage is the development of the OU 10-04 baseline ERA problem formulation. As discussed in Appendix C2 input to the problem formulation includes such activities as the summarization of the WAG ERAs, the evaluation of the biological survey and biotic sampling, the ESRF data and dose reconstruction, and the evaluation of the INEEL species density data. The OU 10-04 ERA problem formulation will result in the development of a preliminary list of the Site-wide COPCs, receptors, and assessment endpoints. Evaluation of the results of the problem formulation should allow the determination of the need for further ecological sampling and/or monitoring to support the OU 10-04 ERA. The specific objectives of the OU 10-04 ERA are discussed in Section 3.5.

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